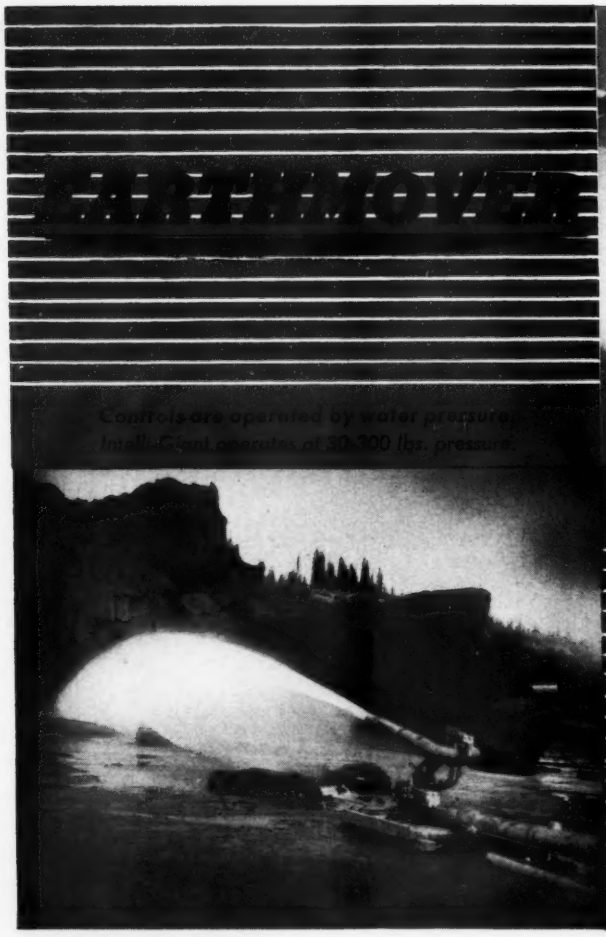
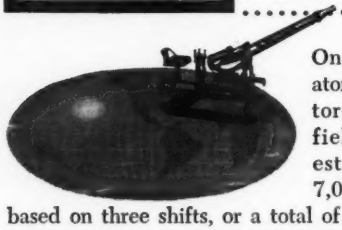
Mining CONGRESS JOURNAL

NOVEMBER 1954

Report on AMC Mining Show



new *chiksan intelli-giant does the job cheaper!*



One progressive operator of hydraulic monitors in the phosphate fields of Florida has estimated a saving of 7,000 man hours a year, based on three shifts, or a total of over $10,000.00 by employing Chiksan Intelli-Giants to do the job.

Another large operator estimates that thru the larger area of earth covered and the use of 3 Chiksan Intelli-Giants hooked up in remote control they will save approximately $22,000 a year in direct labor costs.

After 8 years of exhaustive engineering and field testing, under the most exacting conditions, CHIKSAN has introduced the FIRST revolutionary improvement in hydraulic mining and earth moving in 90 years.

Exacting tests in the removal of perma-frost in Alaska, sluicing in the phosphate fields of Florida, dam construction in Oregon and California have proved the high efficiency and extreme economy of the NEW CHIKSAN INTELLI-GIANT.

CHIKSAN CHIKSAN intelli-Giant

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 3, Illinois • Newark 2, New Jersey

Well Equipment Mfg. Corp. (Division) Houston 1, Texas • Subsidiaries: Chiksan Export Co., Brea, Calif., Newark 2, N. J. • Chiksan of Canada Ltd., Edmonton, Alta.

The Facts Behind Allis-Chalmers Leadership in Torque Converter Tractors

***Fourteen* years of experience . . . *eight* years with production models . . . *thousands* of torque converter tractors out in the field . . . *millions* of operating hours on every kind of work.**

TODAY'S tractor owners have given their "stamp of approval" to torque converter drive—as a key factor in the new standards of tractor performance they need for today's closely-bid jobs. Here's why —

Automatic Matching of speed and pull to load and terrain conditions . . . more dirt moved every hour, day in and day out.

Hydraulically cushioned protection for engine, clutch, transmission, rear end. The entire tractor lasts longer! That means less downtime, lower maintenance costs, more profit.

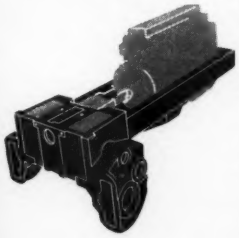
Operators love it! Allis-Chalmers torque converter tractors are so easy to handle (most shifting is eliminated) that operators do a top-notch job all day long.

Yes, the industry's most experienced men are demanding and buying torque converter tractors . . . *and in this, Allis-Chalmers leads the way.*

But, remember, you don't buy just one feature . . . you buy a *tractor*, with torque converter drive designed as a matched part of the entire machine. This advanced drive is only *one* of the many outstanding features that have switched so many leading contractors to Allis-Chalmers tractors. So . . .

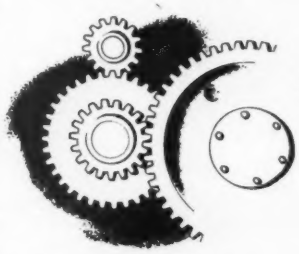
Check all these features before you buy!

All-Steel Box-A Main Frame with one-piece, rear-end housing gives improved weight distribution, soaks up shocks, provides better equipment mounting, greater servicing ease . . . longer equipment life.



Service Simplicity of Unit Construction — Power drive components can be easily removed, repaired or replaced without disturbing adjacent parts . . . saving time and money.

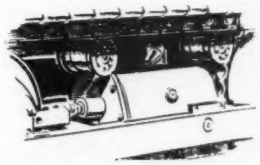
"Live" Sprocket Shafts — "Live" shafts with straddle-mounted bearings permit small, more serviceable seals. Double reduction final drives with smaller gears and shorter, heavier shafts mean extra ground clearance, better alignment, longer life.



1,000-Hour Lubrication — Tapered roller bearings and positive seals on truck wheels, idlers, support rollers and final drives extend lubrication intervals, cut downtime.

Hydraulic Booster Steering — Gives operator small tractor maneuverability with new ease. In addition, self-energizing brakes which take hold with a firm, uniform grip, provide exact control and sure safety with less pedal pressure.

True-Dimension Track provides maximum ground contact . . . plus the right design, the best steels for every job condition . . . heat-treated for long life with the industry's newest, most complete facilities.



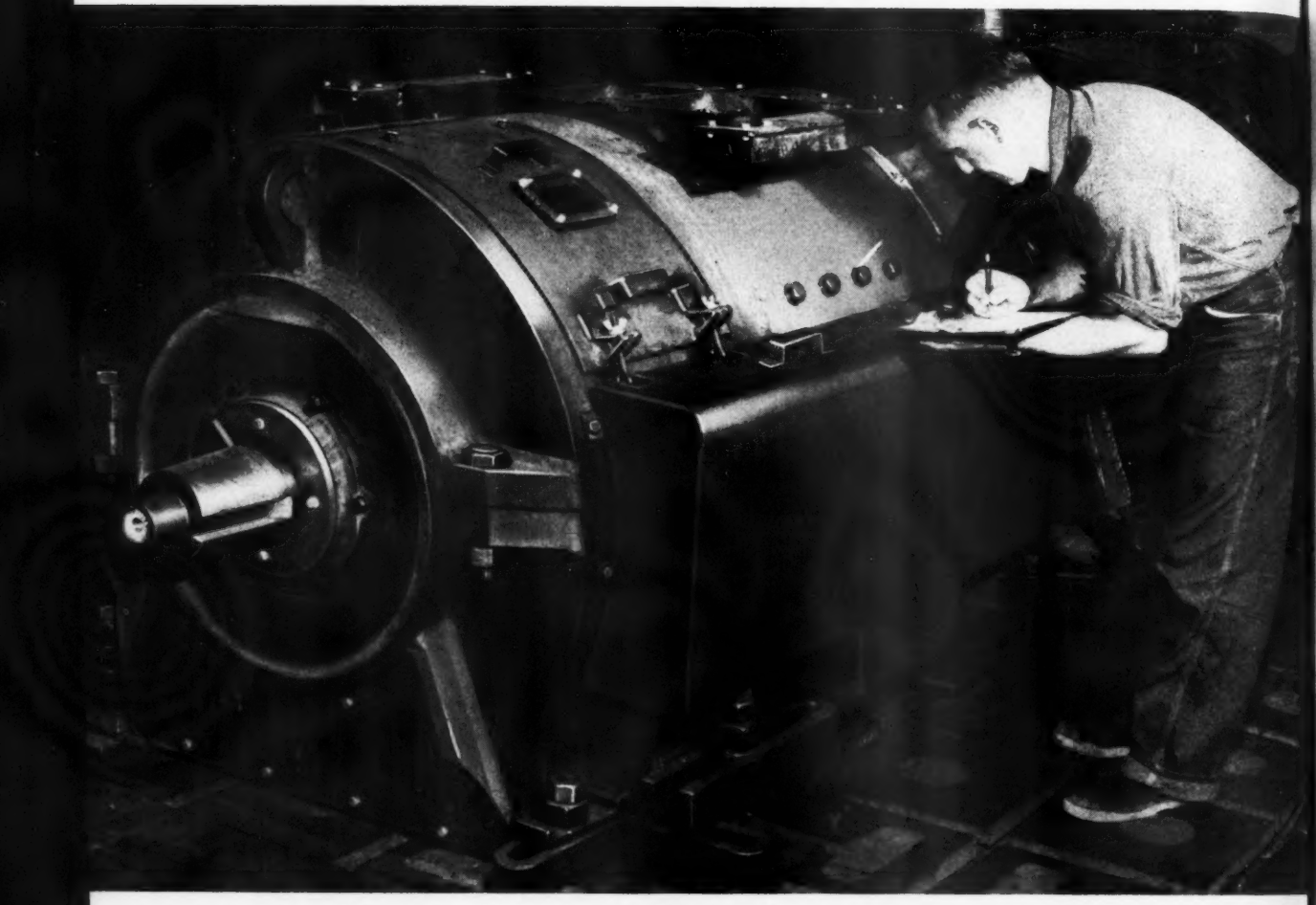
Oil-Enclosed Track Release Mechanism — Operates in oil, seals out dirt and moisture, always in working condition to provide positive protection.

See your nearby Allis-Chalmers dealer now for the full story. Whether you're interested in a big tractor like the HD-20 or HD-15 . . . or the smaller HD-9 and HD-5, you can be sure of getting the most advanced tractor in the business, because Allis-Chalmers is the leadership line.

ALLIS-CHALMERS

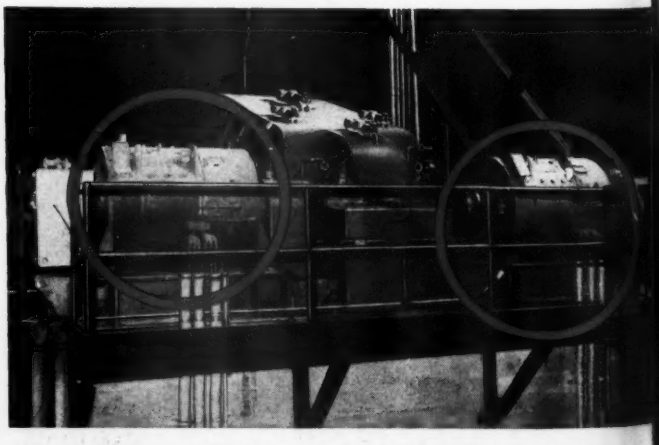
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

NEW G-E Armored Mill Motor—



TO ASSURE YOU of dependable service, this MD-622 is undergoing the rigid tests given to all G-E Armored Motors before shipment.

POWER SHOVEL equipped with compact G-E Type MD motors which have high overload capacity and the ability to take the terrific shocks of excavating duty.



SLAB SHEAR in reversing, blooming and slabbing mill is typical of severe applications in the steel industry that are dependably powered by G-E armored motors.

Most Powerful in its Class

Another G-E "first"—the MD-622—gives you more horsepower and torque than any other mill motor!

POWER-PLUS for the toughest heavy-duty application—that's the job of the MD-622—General Electric's latest addition to the MD-600 Armored Motor line.

AISE OBJECTIVES set up for smaller motors of this type, are met in the construction of the MD-622, which gives you more horsepower, increased commutating ability and better speed regulation in the same mounting dimensions as the earlier motor. Designed for duty in steel mills, power shovels, mine operations, dredges and ore bridges, it's ideal for extra torque, high momentary loads and snappy reversals.

RATED 500 HP AT 350 RPM when force ventilated, this motor delivers more torque relative to its size than any other mill motor ever built.

BETTER SPEED REGULATION can be maintained at higher speeds than in previous motors—and maximum safe speed is 20% higher.

WIDER SPEED RANGE is possible with the adjustable speed MD-622 and stabilizing series windings are not required, simplifying control on reversing operations.

REDUCED MAINTENANCE due to integral feet on armature. Out of frame, it stands by itself. Armature spider allows replacement of shaft without disturbing windings.

FOR NEW BULLETIN on MD-600 motors, fill out the coupon below. If you need more information, contact your nearest G-E Apparatus Sales Office. General Electric Co., Schenectady 5, N. Y.

Please send Bulletin GEA-4654C, "DC Armored Motors," which gives the complete story on the MD-600 line with examples of their reliable performance throughout industry.

General Electric Co.
Section D810-3
Schenectady, N. Y.

☐ Planning an immediate project.
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NAME.....
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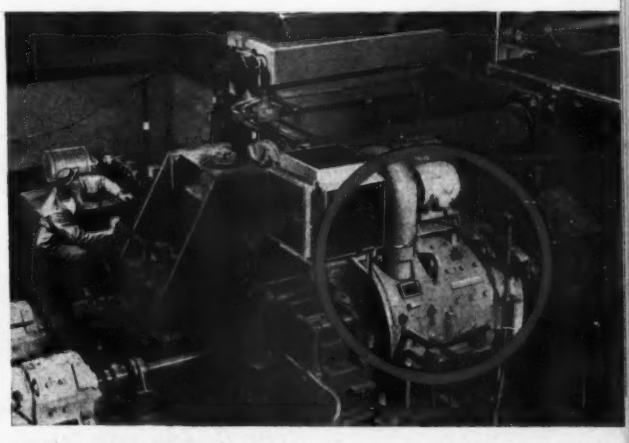
Progress Is Our Most Important Product

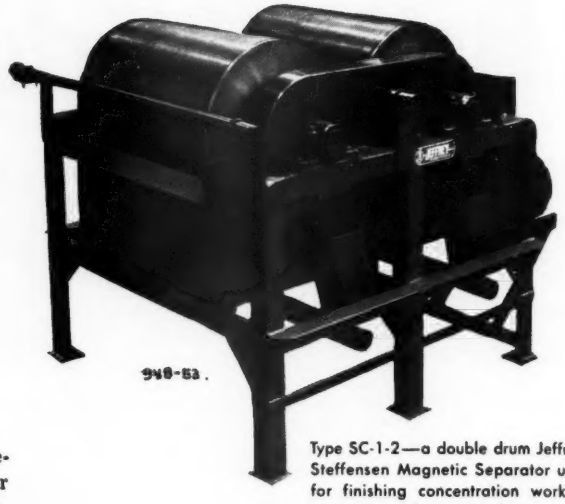
GENERAL ELECTRIC

DRAGLINE powered by amplidyne-controlled G-E armored motors—which were selected because of their high torque and quick reversing characteristics.



COILER in hot strip mill driven by force ventilated G-E armored motor with extra horsepower and mechanical strength to withstand severe operating conditions.

for highest recovery at lowest cost... JEFFREY MAGNETIC SEPARATORS



Type SC-1-2—a double drum Jeffrey-Steffensen Magnetic Separator used for finishing concentration work in magnetite and taconite plants.

Twenty years of concentrated research and improvement, following the development of a Steffensen counter flow magnetic separator, have given Jeffrey world leadership in the drum-type wet magnetic separator field. Jeffrey units are rapidly replacing other types in all industries where more efficient magnetic separation is required.

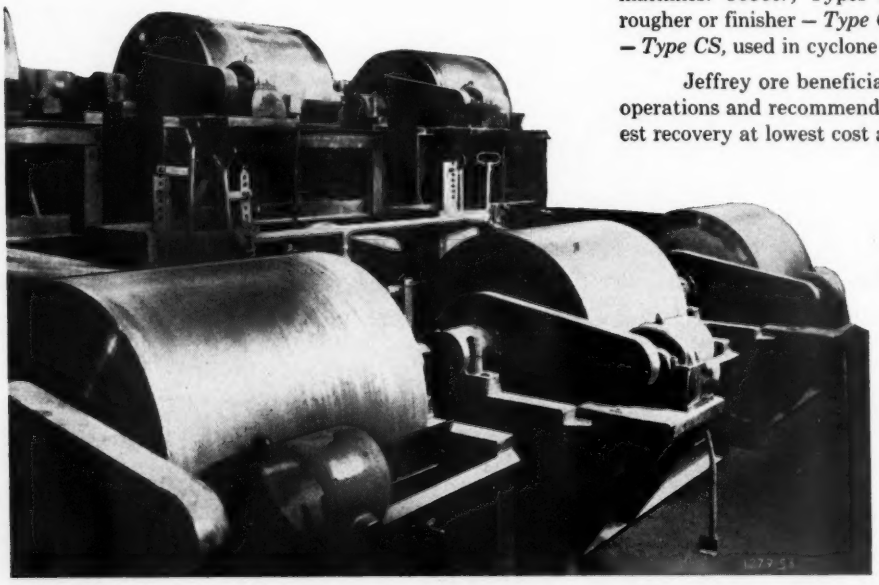
These units pay big dividends in concentrating magnetic taconite and magnetite, and in recovering ferrosilicon and magnetite media used to concentrate other minerals.

Simplicity of design and construction cuts maintenance to a minimum, yet this simplicity gives maximum magnetic recovery.

A typical Jeffrey magnetic separation improvement is the new-type coil. During recent laboratory tests this coil was submerged 120 hours in water dosed with all the chemicals found in hardest water used at mining operations. Under direct current power, the coil gave no evidence of grounding.

Jeffrey manufactures four basic magnetic separation machines: *Cobber,* Types C and S – *Steffensen,* used as rougher or finisher – *Type CO,* used in heavy media plants – *Type CS,* used in cyclone process heavy media plants.

Jeffrey ore beneficiation engineers will study your operations and recommend the ideal installation for highest recovery at lowest cost at your plant.



This battery of six Type CO-1 Jeffrey Magnetic Separators has been recovering ferro-silicon at a Minnesota iron ore heavy media plant for more than two years.

WRITE FOR TECHNICAL DATA

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

...IT'S A JOB FOR JEFFREY!

NOVEMBER, 1954

VOLUME 40 • NUMBER 11

Mining

CONGRESS JOURNAL

CONTENTS

FRONT COVER: More than 7500 mining men and their ladies attended the American Mining Congress 1954 Mining Show in San Francisco's Civic Auditorium

EDITORIALS 27

THE CONNECTING LINK IN PERCUSSION DRILLING:
The Problem—What—Why—How? 28
By B. F. SHEPHERD

Material, Treatment and Design for Drillrods 31
By T. E. NORMAN

A MODERN MINE ACCOUNTING AND STATISTICAL OFFICE 35
By WM. A. FULLARTON

FRICTION TYPE (KOEPE) HOISTS 42
By GUY N. BJORGE

MODERN CHANGE HOUSES FOR THE MINING INDUSTRY 45

ROOF DRILLING SUPERVISION AND MAINTENANCE 48
By W. D. HAWLEY and V. O. MURRAY

OPEN PIT OPERATIONS IN OLD CAVED AREAS 50
By J. C. VAN DE WATER

RECOVER RIVER COAL FOR POWER GENERATION 52
By PAUL LEVIN and J. P. LEDVINA

MINING SHOW HUGE SUCCESS 58
Declaration of Policy 63
Report on Convention Sessions 69

OPERATORS CORNER 82

WHEELS OF GOVERNMENT 83

PERSONAL 85

NEWS AND VIEWS 87

MANUFACTURERS FORUM 105

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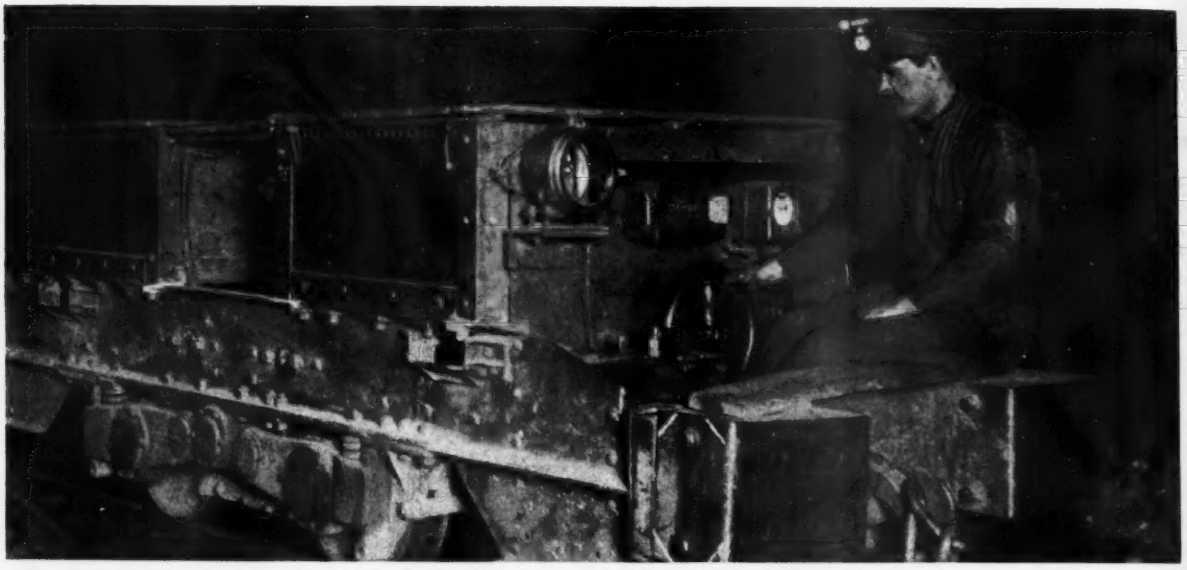
GET FAST, UNIFORM SPEEDS ALL SHIFT LONG

...with self-contained Exide-Ironclad battery power!



YOU CAN count on Exide-Ironclads to help speed up car changes, keep loaders busy and main line haulage moving fast. This means you get more trips per shift, more production per man-hour with less cost per ton handled. Exide powered equipment will handle as much tonnage during the last hour of the shift as during the first. Lower costs for operation, maintenance and depreciation make Exide-Ironclad batteries your best power buy—AT ANY PRICE!

THE POSITIVE PLATES are the heart of any battery. Only Exide uses a slotted tube construction. By use of tubes, more active material is exposed to the electrolyte, providing *greater power*. Also, more active material is retained, giving *longer working life*.

THE NEW THRIFTY HAULER! The improved locomotive battery using *non-oxidizing* plastic power tubes for longest battery life, more capacity in the same space. For full details, call your Exide sales engineer—write for Form 1982 (Installation and Maintenance of Motive Power).

Your best power buy
...AT ANY PRICE!

Exide®
IRONCLAD® BATTERIES

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

12 years of the right oil keeps air compressor . . . .

■ Keeping this air-compressor trouble-free and always on the job is a "must" at General Chemical's fluorspar mine located near Boulder, Colorado. Under rough conditions of fluctuating loads the compressor supplies air for air tools, rock drills, slushers and other vital mining tools.

Constant operation calls for an oil that will keep wear to a minimum . . . and assure trouble-free compressor out-put to keep these tools working.

In a recent twelve year stretch, STANOIL #31 was the oil relied on to keep this unit on the job.

At the end of this period the engine was taken down for inspection. With this hard-working oil assuring day-in day-out protection these were the findings. There were no carbon deposits and no cylinder wear. Protection had been so thorough that the rings showed *no signs of wear whatsoever!* In fact, they were in such like-new condition that they were put back into use!

STANOIL
TRADE MARK
Industrial Oil

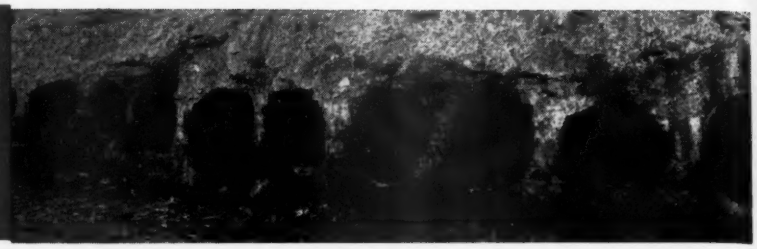
. . . . GOOD AS NEW!

This is Standard Oil's E. K. Arnston who helped General Chemical save time and money with superior lubrication. For help like this call your nearest Standard Oil office or write to Standard Oil, Chicago.

STANDARD OIL COMPANY (*Indiana*)

STANDARD

SALVAGING LOST COAL



● McCarthy Coal Recovery Drills put new profit in worked-out strip mines by recovering clean lump or slack coal without disturbing overburden.

The drills bore horizontally into the heart of the exposed seam to pull out continuous streams of coal from depths of 100 feet and more.

Cost of this operation varies between $1.50 and $2.00 per ton, including amortization of investment. A three-man crew can handle the entire job, including loading.

Rate of recovery depends entirely upon operator skill, bench width, seam thickness and diameter of auger used.

We suggest you write today to determine which of four standard models is most suitable for your requirements.

McCarthy hydraulically controlled Drills are available with 4 to 24-ft. interlocking-auger sections in 20, 24, 30, 36, 42 and 48-inch diameters. Jacks are power operated with power supplied through gasoline, diesel or electric units.

Make it a point to investigate this economical new method for recovering coal right now.

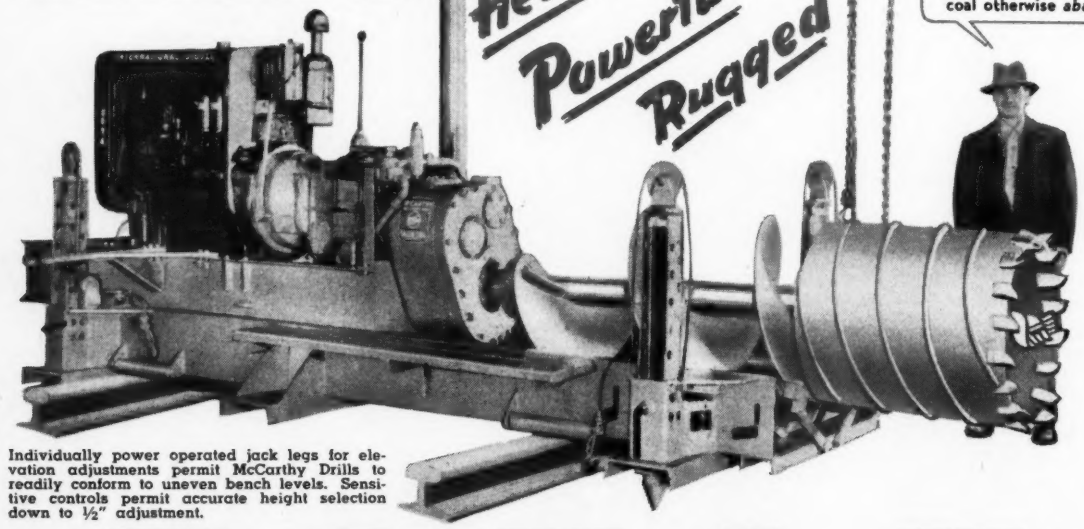
Near Salineville, Ohio, three men, using a single McCarthy Drill equipped with 24-inch augers, get out 90 tons of coal daily. The same number of men, working for the Bruns Coal Company, near Germano, Ohio, use 36-inch auger sections to produce 167 tons per day.

McCarthy Auger Hoist makes easy the handling of individual auger sections to allow fast operation in or out with minimum physical labor.

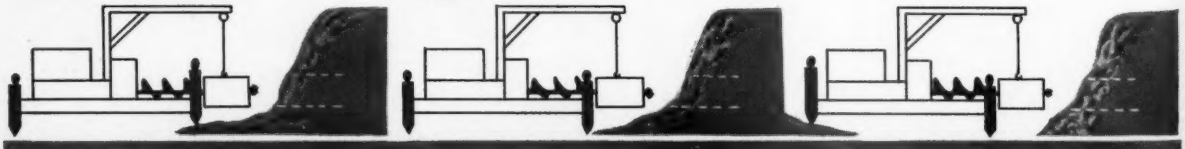
McCARTHY
New 36" Recovery Drill; weight 9,700 lbs.

Heavy Powerful Rugged

"I salvaged 200,000 tons of coal otherwise *abandoned.*"



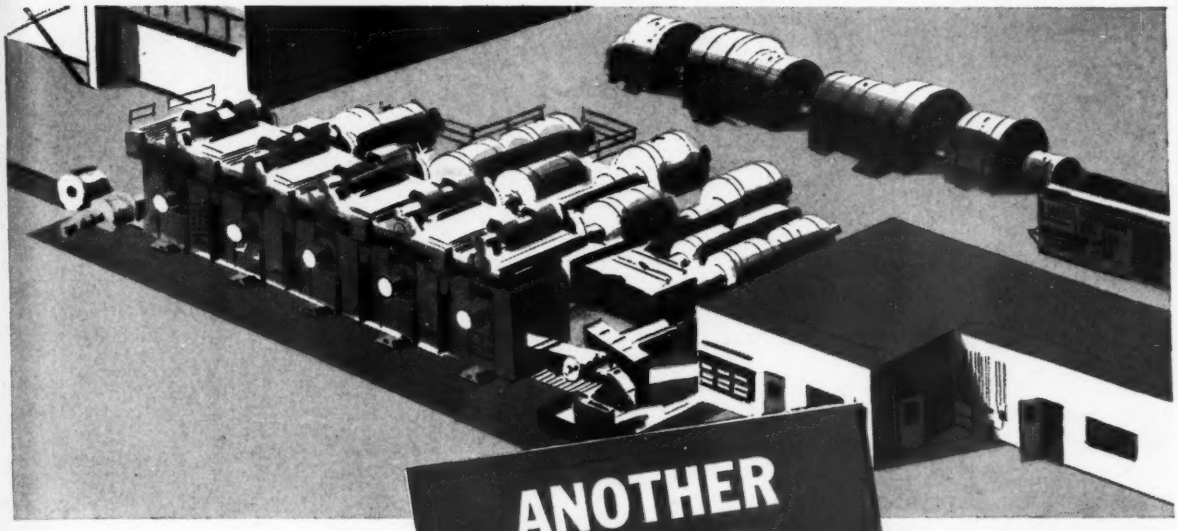
Individually power operated jack legs for elevation adjustments permit McCarthy Drills to readily conform to uneven bench levels. Sensitive controls permit accurate height selection down to ½" adjustment.



SALEM

THE SALEM TOOL CO.

779 SOUTH ELLSWORTH AVENUE - SALEM, OHIO, U. S. A.



ANOTHER BIG JOB DONE BETTER

WITH NATIONAL BRUSHES
TRADE-MARK

NATIONAL CARBON has, for years, analyzed and supplied the proper brushes for large, steel-mill-production equipment.

TYPICAL EXAMPLE is a five-stand tandem cold mill of the type shown, covering just about the widest range of motor types and brush requirements found in any integrated unit. Calling upon its long experience and diversified product line, National Carbon recommended a specific brush grade for every electrical component in the mill, from pump motors to main drives.

RESULTS were outstandingly successful. Production was established at a high level of availability and has continued at the same rate.

NATIONAL CARBON COMPANY works closely with equipment manufacturers, power companies and principal users of industrial power. Customers know that for *all* motor and generator problems, no other brush supplier can match National Carbon's combination of experience, product-diversification and service-facilities.

Let "National" brushes show you how good really good brush performance can be!

ELECTRICAL AND MAINTENANCE SUPERINTENDENTS!
Give Your Men This FREE Maintenance Course

Mail coupon and receive as many copies as you need — without obligation. Short, entertaining, instructive installments. Profusely illustrated. Quick reference for many day-to-day maintenance problems. Useful for trainees. First mailing includes all back issues.

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Uranium Exploration on the Colorado Plateau!

From the beginning of the current spectacular uranium developments in Colorado, Utah and other adjoining states, Sprague & Henwood, Inc. has placed its equipment and personnel, fully and competently, at the disposal of both Government agencies and private mining interests.

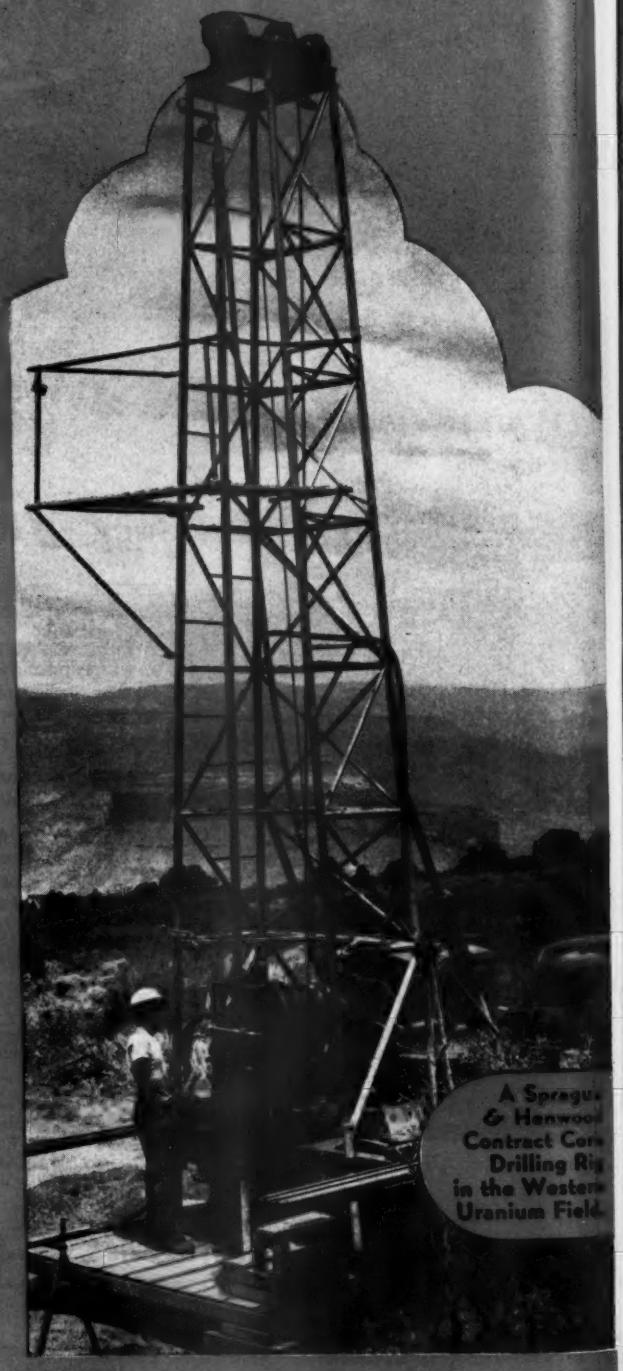
As a result of this prompt action, backed by a 60-year record of world-wide experience, we have been awarded contracts for many thousands of linear feet of

DIAMOND CORE DRILLING

much of which has already been successfully completed.

At present we are busily engaged but, having moved many of our best operators and drilling rigs into the area, are prepared to handle new core-drilling contracts promptly and efficiently.

A new branch office and shop has been established on the Fruita Highway, near Grand Junction, Colorado, to help provide the best possible service throughout the Western Uranium Field. For quick action 'phone Robert R. Carver, Manager, at Grand Junction 834. He knows the answers to most drilling problems—through personal experience.



A Sprague & Henwood Contract Core Drilling Rig in the Western Uranium Field.

Sprague & Henwood, Inc.

Scranton 2, Pa.

New York Philadelphia Pittsburgh

Grand Junction, Col. Buchans, Newfoundland

Manufacturers, also, of High-Speed Core Drilling Machines, "Oriented Diamond Bits" and complete accessory equipment for Core Drilling and Soil Sampling. Illustrated bulletins containing complete information mailed on request.

The Sun never sets on Sprague & Henwood's Contract Diamond Core Drilling Operations

SAVE TIME CHANGING ROCK BITS!

TIMKEN® multi-use, carbide insert bits, interchangeable on the same drill steel!

TIMKEN® multi-use and carbide insert bits save you valuable drilling time because they're interchangeable on the same steel. In a minute, a driller can unscrew one type of Timken bit and screw on another type. There's no time wasted going after another set of drill steels.

You save money, too, with Timken rock bits. Drillers can change to the most economical bits as the ground changes. And the need for keeping large inventories of drill steels is eliminated.

In either type of Timken rock bit—multi-use or carbide insert—you're assured of two important advantages. 1) Timken rock bits are made from electric furnace Timken alloy steel. 2) A special shoulder union keeps drilling impact from damaging threads.

Got a drilling problem you want solved? Call on our rock bit engineers. They're recognized experts in cutting drilling costs. And, of course, there's no obligation for this service. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

HOW TIMKEN MULTI-USE BITS SAVE YOU MONEY

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hard, abrasive ground. Also most economical for constant gage holes, small-diameter holes, very deep holes.

... your best bet for the best bit... for every job

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

MODERN SCHEDULES DEMAND—POWER . . .

FLUID POWER

DUDCO DIVISION
Hazel Park, Mich.
Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation. Piston-Type Pumps for 5000 psi.

HYDRECO DIVISION
Cleveland, Ohio
Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi.

WATERTOWN DIVISION
Watertown, N. Y.
Railroad air brake valves for freight and passenger equipment, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, Centrifugals, 4000 gpm, 500 ft. heads. Turbine-Types, 7000 gpm. Condensate Return Units.

Vehicles that haul 75 ton loads . . . Shovels that handle 16 yards and more at a single bite . . . these are but two of the many juggernauts that move mountains or mole hills . . . that give industry *higher production at lower cost.* And the key to velvet-smooth control of all this harnessed energy is Fluid Power!

Mine, Construction, Marine, Oil Field, Farm and Materials Handling Equipment attain ever-increasing productivity through the rugged dependability of Fluid Power. Machine Tools, Presses, Paper Machinery, Petro-chemical and other processing equipment achieve greater automation plus micrometric precision through Fluid Power.

There are three divisions of The New York Air Brake Company which concentrate on the development of advanced design hydraulic equipment for this Fluid Power. Thus, from a single source, industry may have the ideal component for the specific function. . . . Gear, Dual-Vane and Piston Pumps, embracing a full range of capacities and pressures to 5000 psi, and Motors, Control Valves and Cylinders to develop complete hydraulic circuits.

In addition to Fluid Power, industry finds the answers to its liquid handling problems in Aurora and Kinney Pumps. "Any material that can be pushed through a pipe" . . . from gasoline and alcohol to tars, sludges, slurries and other heavy semi-solids . . . and the less dramatic tasks of sump, deep well, boiler feed, and household needs are all dependably handled by these famous pumps.

Write today for literature containing hundreds of ideas for you to improve your product, increase production and lower costs.

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.

FIRST STEP to efficient taconite blasting—operator loading "Nitramex" No. 2 in northern Minnesota open pit iron mine. Thanks to the watertight metal containers, this can be done long before firing.

NEXT, "Nitramon" Primer is connected up with "Primacord," then lowered. This primer consistently sets off the charges . . . it's today's safest method!

Shooting taconite?

For better breakage, greater safety use DU PONT "NITRAMEX" No. 2

To take taconite shooting in stride and make each shot safer—use Du Pont Nitramex® No. 2 ammonium nitrate blasting agent. This hard-hitting product gives you the strength you need in tough formations to get excellent breakage. Just as important, built-in safety features minimize blasting hazards.

Fire, friction and sudden shock are no problem. "Nitramex" No. 2 can be detonated efficiently *only* by a "Nitramon" Primer, also relatively insensitive, and it does the job every time. Handling's safe and efficient, as neither contains nitroglycerin or is headache-producing. And you can load the charges weeks in advance of blasting. Sturdy metal cylinders protect them in wet holes, adverse weather. Another point customers appreciate: "Nitramex" No. 2 is absolutely non-freezing, assuring dependable shots whatever the temperature.

So test Du Pont "Nitramex" No. 2 in your own mining operation. You'll find it has the blasting power to handle tough rock . . . and provide an extra measure of safety on every job. For detailed information on this and all other members of the Du Pont ore-blasting "team," contact the Du Pont representative in your district. He'd like to be of service to you. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

DU PONT

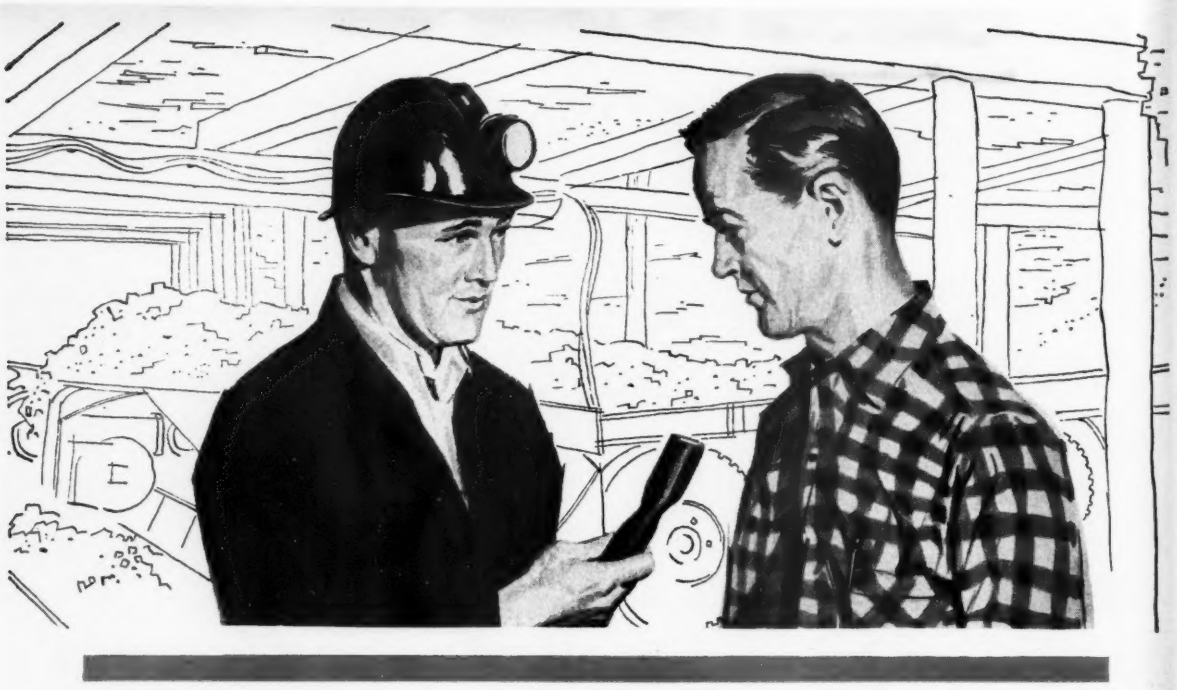
BLASTING AGENTS

Products of Du Pont Research

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*



"Say, what's wrong with my mine cable?"

"Lots of times we find cable sections like this—necked-down. And that's only one of our troubles. Our cables short out too often. Sometimes jackets creep back from splices. Other times we find broken ground wires. What in thunder are we doing wrong?"

"Well, here's a big part of your trouble:"

"Hourglass sections are a sure sign of too much tension on the cable. So are the other troubles you mention. To end tension . . . keep spring-type shocks at the power source. Keep the reel pulling evenly. Adjust it so there's no back-spooling. Watch out for kinks. And be sure you use a cable that can take it when the going gets tough. Then you'll put an end to your trouble and keep your cables on the job far longer. And remember, one break costs more than the difference in price between a cheap cable and a quality one!"

Be sure with Anaconda's new shuttle car cable

Are cables all alike? No! Quality cables — like ANACONDA's Securityflex* — have proved themselves over the years. Here's why ANACONDA Cables last longer and are safer. The ground wire can stretch more. It will *not* break before the power conductors. *That's a real safety feature.* Jacket is made of a new Neoprene formula. It is stronger. Insulation is long-life, tough cold rubber. It all adds up to real economy *in use.* Get the full facts from your Anaconda Representative. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Trade Mark

54027

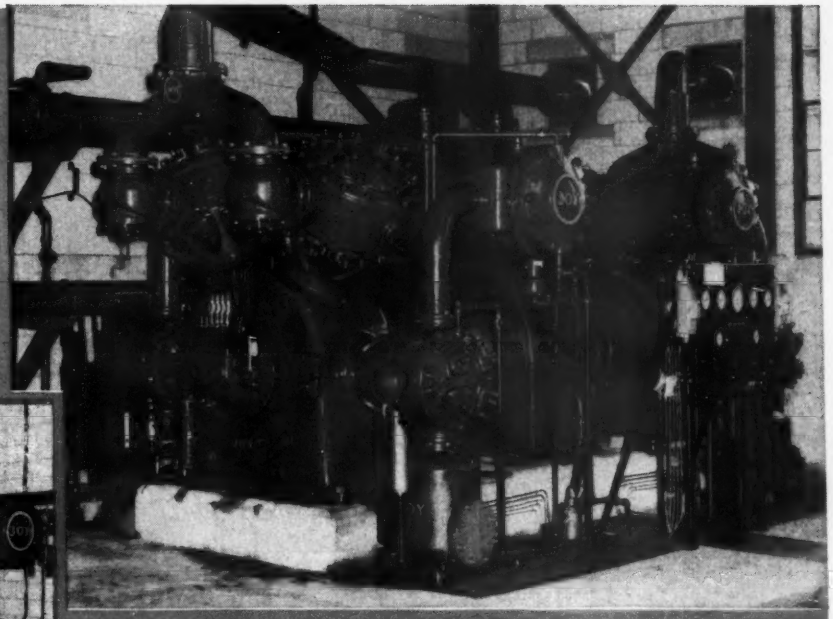
the right cable for the job

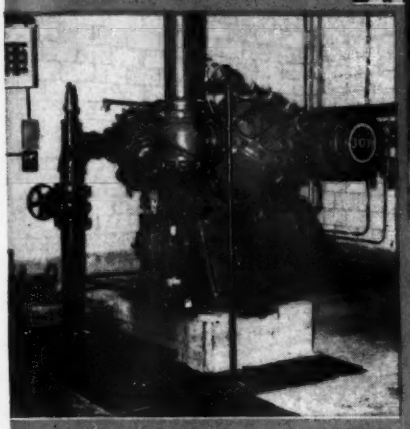
ANACONDA®

WIRE AND CABLE

WN-114—Large metal mine installation, typical of Joy compressor installations at many modern large mines.

WN-112—Typical installation at an eastern lead-zinc mine, one of the many WN-112's in smaller mine service.





JOY LOW MAINTENANCE AIR COMPRESSORS

keep drills, slushers and mucking machines working

HERE'S WHY:

- Monad, field-replaceable crosshead and cylinder liners.
- Exclusive "Dual Cushion" Valves—large area, low lift.
- Factory assembly and testing to insure permanent alignment.
- One-piece, box-type tinned crossheads.
- Full force-feed lubrication.
- Precision crankpin and crosshead pin bearings.

The Joy WN-114 and WN-112 are heavy-duty, two-stage, double-acting package-type compressors with displacement capacities from 368 to 3896 CFM. Other stationary compressors are available with capacities as low as 1.2 CFM and pressures from 30 to 600 psi. Ask Joy for an air-power survey of your mine. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

for AIR COMPRESSORS, ROCK DRILLS, HOISTS AND SLUSHERS

JOY

W&D MB403

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

$108 Saved Each Working Day On Trip Riders Alone . . . . .

How Much Would The Advantages Below Save You?

REGENT SLOPE MINE SAYS:

- "We'd need at least six trip riders—if we didn't have O-B Couplers—at about eighteen bucks a day per man."
- ". . hasn't been one coupling accident in this mine since we got O-B Couplers over six years ago."
- "Maintenance of O-B Couplers is several times less than that of any other type of coupling I've ever had experience with."
- "We don't have any runaway cars or broken trips."
- "We save valuable time the way O-B Couplers automatically couple on contact. No hands needed."

Ohio Brass

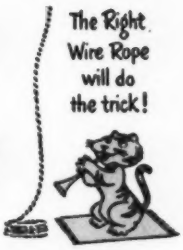
MANSFIELD OHIO, U. S. A.

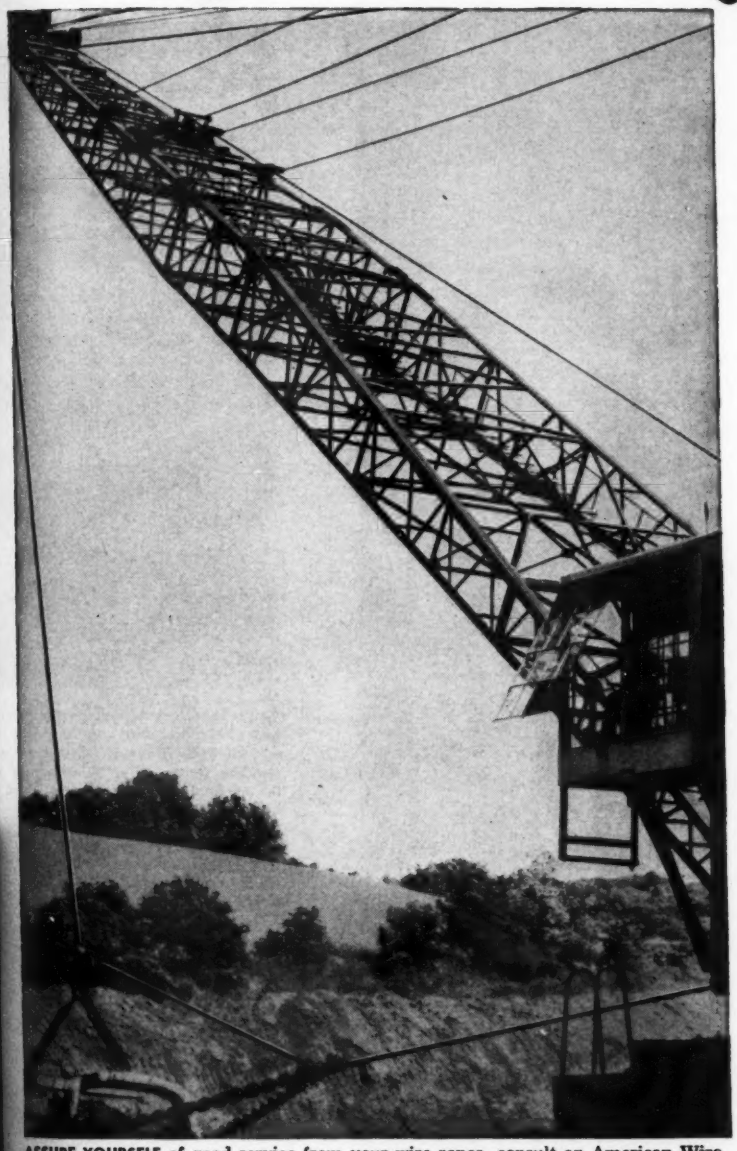
IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

4497-AM

TROUBLE-FREE SERVICE around the clock from Tiger Brand Drag Rope





ASSURE YOURSELF of good service from your wire ropes—consult an American Wire Rope Engineer regularly.

ONE of the largest coal companies in Pennsylvania gets excellent service from Tiger Brand Wire Rope. On this big dragline, for example, 2¼" Tiger Brand Drag Rope lasts for 8 to 12 weeks, and 1⅜" Tiger Brand Hoist Rope lasts 4 to 6 months. This is good service, because these ropes work 24 hours a day, 6 days a week, every week of the year.

As a result of consistently good service records like these, many such operators use Tiger Brand Wire Rope exclusively on all their excavating machinery.

Like hundreds of other companies that do a lot of excavating, you will find that once you start using Tiger Brand Wire Rope, you keep down rope costs, keep down rope trouble, and *keep on using* Tiger Brand.

For a list of Tiger Brand Wire Ropes and the jobs each one can do best, send the coupon.

FREE ROPE BOOKLET

American Steel & Wire
Dept. N-114, Rockefeller Building
Cleveland 13, Ohio

Please send me, without obligation, a copy of your helpful wire rope selection guide, "The Right Rope for the Job."

Name.....

Company.....

Address.....

City & State.....

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

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UNITED STATES STEEL

NOW — with

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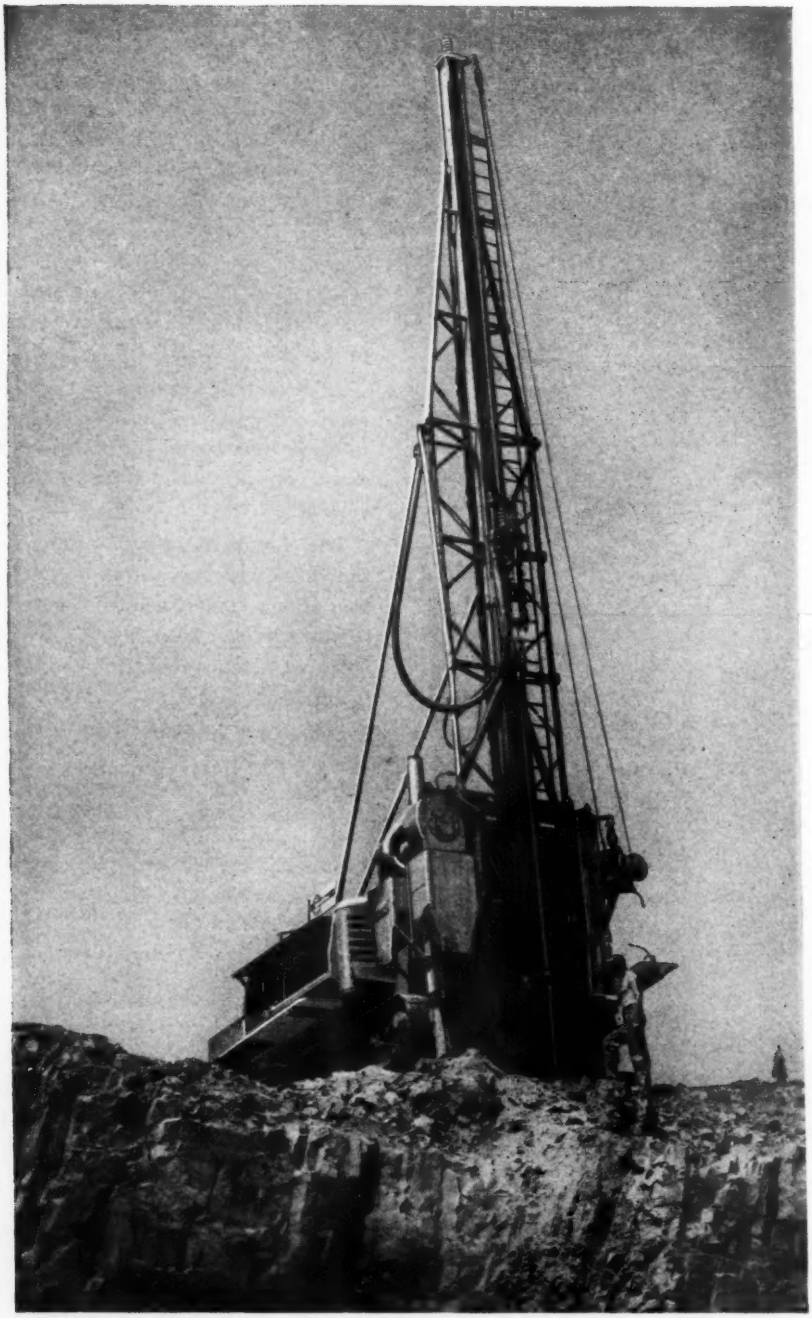


Ingersoll-Rand Quarrymaster, with percussion-type drill, sinking primary blast holes on a large construction project. Note how close to the face the holes can be drilled.

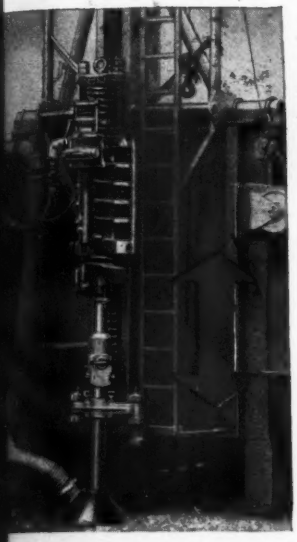
Power for rotary drilling is supplied t
powerful twin multivane reversible
motors. Drills 20 to 150 feet per h
pending on the rock. Hole cleaning
the percussion drill, is automatic a
by air.

Uses rotary type bits up to 9" in d
—These are the same familiar oil fi
bits used the world over.

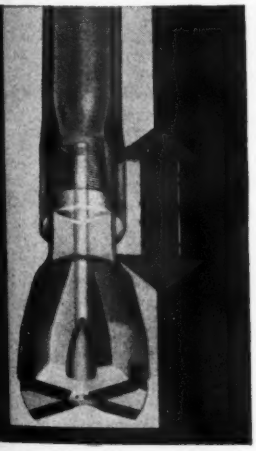
ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BL

One Machine . . .

OR PERCUSSION DRILLING



t of the percussion machine is this erful air-operated piston drill that es 200 blows per minute. Drilling ds range from 10 to 50 feet per hour. cleaning is done by air and is entirely matic.



et bit life is 700 to 1600 feet in granite to 14,000 feet in soft, less abrasive mations. Bits up to 6½" diameter.

NEW UNIVERSAL QUARRYMASTER

permits fastest drilling in any type of ground!

Here is the first *universal drill*—a completely self-contained, self-powered and self-propelled machine with interchangeable rotary and percussion drilling units. It enables you to use whichever drilling method is best suited to the type of ground being worked.

When equipped with the powerful *piston drill,* the Quarrymaster can drill any type of material from the hardest rock to consolidated top soils and hard pans. When a *rotary* drilling head is applied it is ideal for the softer or less abrasive rocks and overburdens.

In open pit mining whether your cap rock is hard and the ore soft, or vice versa, the Quarrymaster will drill either one at the fastest rate and the cheapest way possible. If you are a drilling contractor or quarry operator, the dual principle gives you the right drill for any rock conditions, anywhere.

Conversion from one type to the other takes but a few hours and consists of simply removing one drill from the tower and replacing it with the other.

The Ingersoll-Rand Quarrymaster is reducing primary blast-hole drilling costs all over the world. Now, with the new Universal Design, it offers still greater opportunities for saving time and expense on *any* deep hole job!

Call your Ingersoll-Rand branch office today for complete information on the new Quarrymaster. Or write for your copy of Bulletin No. 4153.

Ingersoll-Rand

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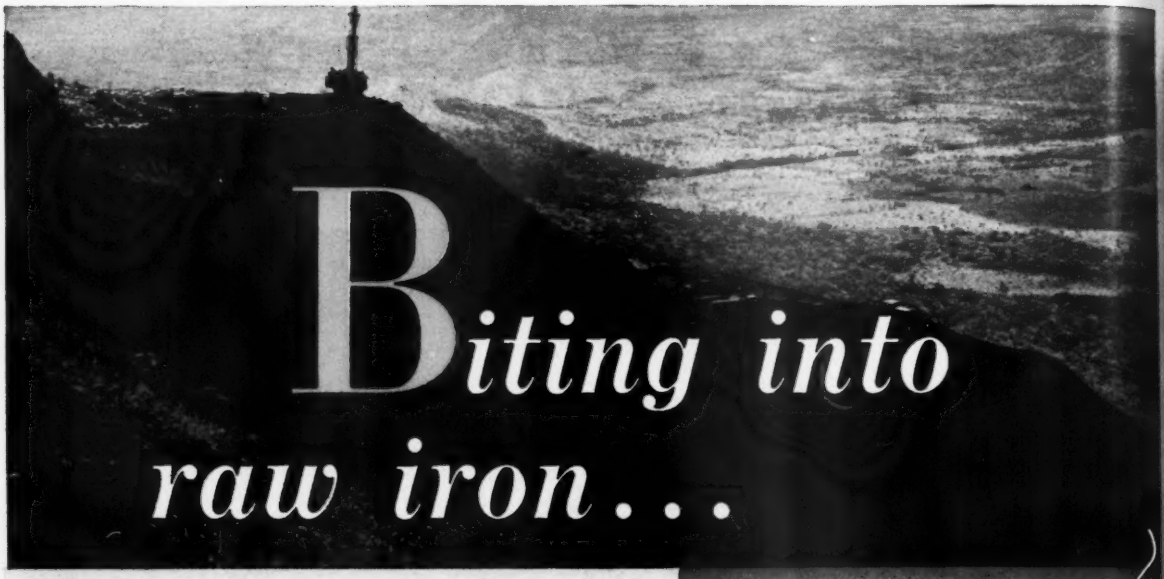
5-73

CONDENSERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES



Biting into raw iron...

Two years of tough, schedule-smashing construction by the men of Morrison-Knudsen Company made possible the first shipment of ore from Venezuela's Cerro Bolivar, for the United States Steel Corporation.

To reach the ore deposits, a 91-mile railroad and an 80-mile highway had to be constructed. A monthly average of 400,000 cubic yards of earth and rock was moved to prepare the railway grade alone. Part of the way, excavation was almost entirely in double-extra-hard granite, with a crushing strength of 60,000 psi. And on the southern slope of Cerro Bolivar itself, scores of side-hill cuts were made through hard layers of solid ore that graded 65% or more pure metal.

This was a job that demanded an exceptional combination of engineering skill, determination, and the best of construction and drilling equipment... that's why Crucible Hollow Drill Rods were chosen. For *lowest cost per foot of hole drilled* specify Crucible Hollow Drill Rods.

Crucible Hollow Drill Steel in machines like these bite into ore on Cerro Bolivar.

One of the men who helped make the project possible — C. Dugan Graham, vice-president of M-K de Venezuela, and project manager in charge of the job.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

HOLLOW DRILL ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

IMPOSSIBLE WITHOUT EXPLOSIVES

Stripping operations accounted for nearly one quarter of the total production of coal last year. This photo illustrates a deposit five feet thick which could be reached only by blasting and removing 75 feet of over-burden. This is the kind of job that never could be handled economically without explosives. Hercules has pioneered in developing the right types of explosives and has the service facilities to help you to solve blasting problems concerning coal mining, metal mining, quarrying, construction, or petroleum.

HERCULES POWDER COMPANY
INCORPORATED

Explosives Department, 922 King St., Wilmington 99, Del.

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Cal.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Cal.

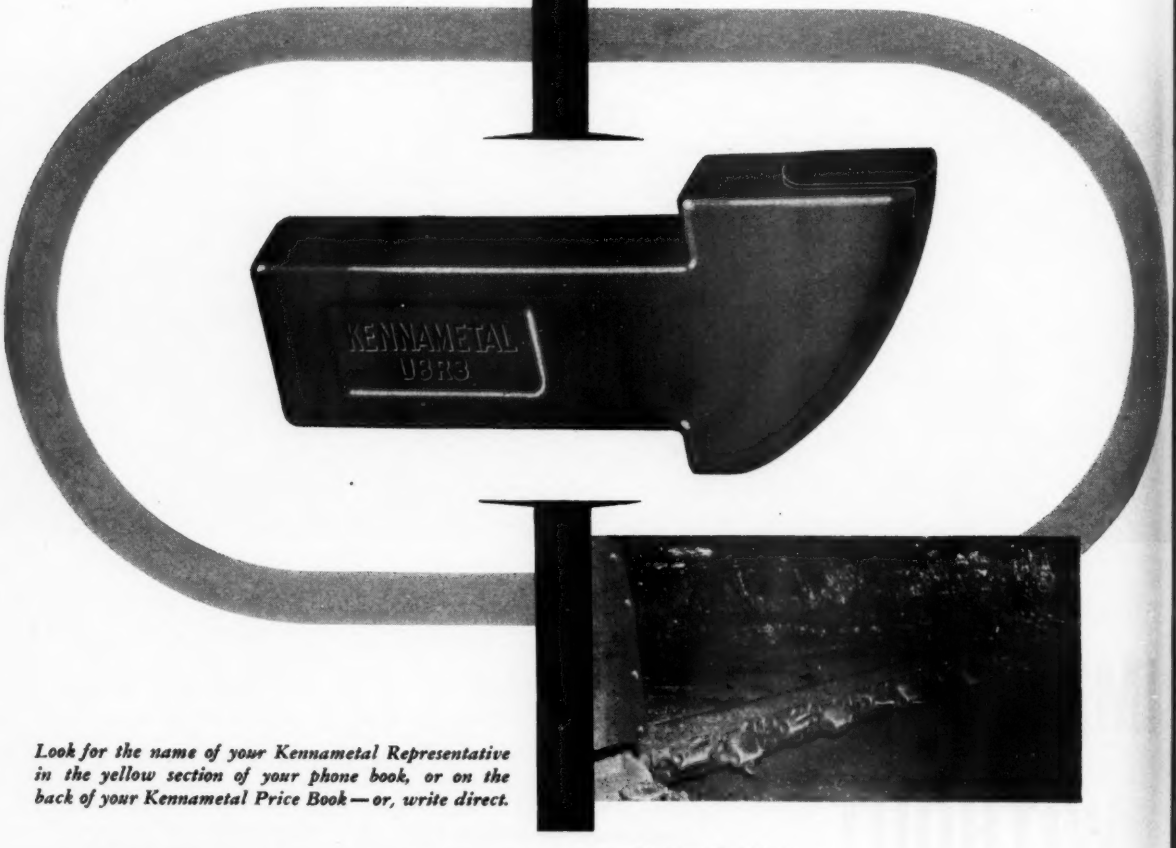
XR 54-7

get extra savings in easy cutting with KENNAMETAL*

At a large colliery in West Virginia, one set of Kennametal U8R3 Bits cut 1440 30-ft. places at a bit cost of only $.0013 per ton. Previous costs here had been reasonable because of relatively easy cutting conditions, yet use of tough Kennametal Bits not only *reduced* these costs, but produced better coal, with less dust.

Controller repair costs are down 50% . . . power consumption is 15% less . . . cutting time per place has been reduced by 20 minutes . . . cuttings are coarser — there is more pea coal.

Kennametal Bits — the economical answer to *severe* cutting problems — can also effect *extra* savings in ordinary cutting conditions because they stay sharp longer, take harder knocks than any other tungsten carbide. Your Kennametal Representative would like to go into your mine and demonstrate. Call him anytime.



Look for the name of your Kennametal Representative in the yellow section of your phone book, or on the back of your Kennametal Price Book — or, write direct.

* Registered Trade-Mark

KENNAMETAL
KENNAMETAL INC., MINING TOOL DIVISION
BEDFORD, PA.
General Offices and Main Plant at Latrobe, Pa.

World's Largest Manufacturer of Tungsten-Carbide
Drill Bits, Cutter Bits, Roof Bits, Strip Bits

Those Who Use It... Choose It Again

38.6% of all Hydrocranes Sold are Repeat Orders

Yes, 38.6 percent of all Hydrocranes sold are additional machines bought by satisfied users. In fact, many owners are now fleet operators — buying a 3rd, 4th, 5th and even a 6th Hydrocrane! Here's real proof that this all-hydraulic truck crane produces big, gives owners an extra profit pay-off.

Only Hydrocrane gives you all these!

- "Reach-ability" with hydraulically telescoping boom.
- Maneuverability with extremely short tail swing, low over-all height.
- Extra stability with four hydraulically controlled outriggers.
- Mobility with speeds up to 50 mph.
- "Control-ability" with full hydraulic, finger-tip control.

Plus more for '54.

- Self-power — Hydrocrane has its own independent power unit. (optional)
- Remote control — start it, drive it, turn it, stop it right from the crane cab. (optional)
- Selector unit — foot control channels *extra* hydraulic fluid to hoist valve bank circuit— gives you 50% faster line speed. (optional)
- Increased line speeds — even without selector valve unit, all line speeds are now 10% faster.
- New pressure relief valve — provides even better control of hydraulic pressure.
- Increased crane rating — maximum capacity now 4-ton with 2-part hoist.

Arrange a demonstration now!

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin

H-3 Hydrocrane owned by Pittsburgh Consolidated Coal Co. removing sand and silt from settling dam. This material was washed away from coal in tipple at company's mine #63 Monongah, West Virginia.

BUCYRUS-ERIE COMPANY • South Milwaukee, Wisconsin

BUCYRUS ERIE HYDROCRANE

Gentlemen:

Please send literature on

- ☐ self-powered and standard Hydrocrane
- ☐ self-powered and standard Hydrohoe
- ☐ remote control Hydrocrane-Hydrohoe
- ☐ wrist action dipper
- ☐ I am interested in a demonstration

Name_____

Company_____

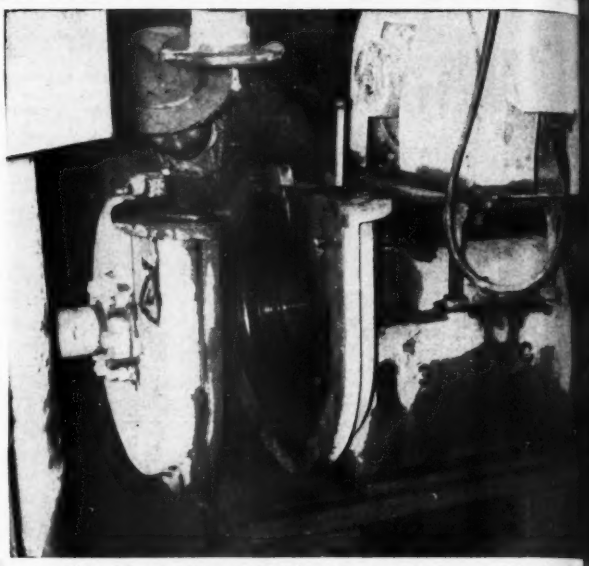
Address_____

City_____ State_____

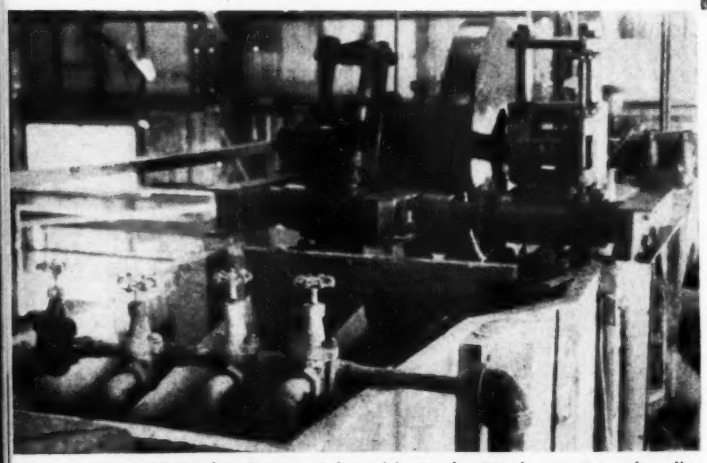
41H54

LOWER PUMPING COSTS WITH DENVER PUMPS

Complete line of Denver Pumps solves need for specialized pumps for special jobs. Experienced engineers can recommend practical solutions to pulp handling that have reduced horsepower and part cost in mills throughout the world. We invite your inquiry on any pumping problem. Detailed technical bulletin on any Denver Pump will be gladly sent on request.



This 3" x 3" Type "C" (closed runner) Denver SRL Pump used to pump cleaned zinc concentrates to cyanide circu Pump is opened for inspection of runner. Rubber lining giv greater pumping efficiency, lowers horsepower requireme and increases wearing part life. Note slide base for movi pump back from casing for ease of inspection and repla ment of parts.



6" Duplex Denver Adjustable Stroke Diaphragm Pump handles underflow from hydroclassifier. Pump discharges into splitter box that distributes flow to 4 regrind circuits. Adjustable stroke mechanism means control of density and volume while pump is operating. Denver Adjustable Stroke Diaphragm Pumps are available in sizes to the 6" quadruplex unit.

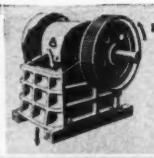
Not illustrated is the Denver Suction-Pressure Diaphragm Pump, used to elevate pulps higher than is possible with standard diaphragm pumps.

Denver Vertical Sand Pumps in Mill of Fluorspar producer in Mexico handle 110 Tons/24 hrs. of classifier overflow at 1.5 sp.gr., 40% solids. Wearing part life exceeding 5 months.

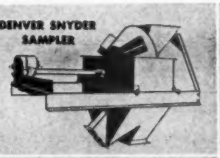
DECO — 24 HOUR SERVICE COMPANY

COMPLETE MILL SERVICE FROM ORE TEST TO MILL INSTALLATION

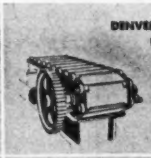
"The firm that makes its friends happier, healthier and wealthier"



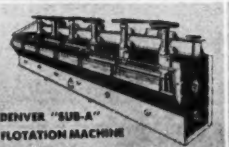
DENVER JAW CRUSHER



DENVER SNYDER SAMPLER



DENVER APRON ORE FEEDER



DENVER "SUB-A" FLOTATION MACHINE

DENVER STEEL HEAD BALL MILL

DENVER MILL DESIGN

DENVER EQUIPMENT CO.

1400 17th St., Denver 17, Colorado

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TORONTO · VANCOUVER · MEXICO, D. F. · LONDON · JOHANNESBURG

"Twin Safety Latches" on S-D Automatic Cars PREVENT DOORS OPENING ACCIDENTALLY!

S-D AUTOMATIC CAR DOORS open only when exclusive "Twin Safety Latches" are tripped simultaneously. This means that if one latch is tripped independently, the other latch will continue to support the door. The simultaneous unlatching can be accomplished *only by the independently operated pair of tripping devices* mounted between rails. These "Twin Safety Latches" act as two padlocks for safe and sure latching . . . preventing doors opening accidentally anywhere along the haulage route. The cutaway view at right shows the "Twin Safety Latches" with cover plate raised. The drawing below photo illustrates how each tripping device between the rails unlocks the doors while the trip is moving over the bin.

Other important features offered only by S-D Automatics include: (1) from a quarter to half-ton greater capacity for any over-all dimension and (2) the only automatic dumping car completely sealed against dust leakage. This big improvement gives you safer operation by preventing leakage of dust and enables you to eliminate the major portion of track clean-up costs. For complete information write us today. *Sanford-Day Iron Works, Inc., P. O. Box 1511, Knoxville, Tenn. Telephone 3-4191.*

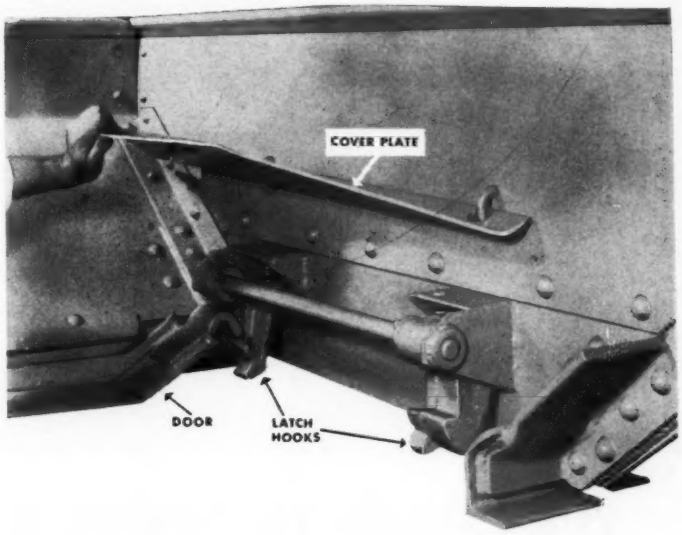
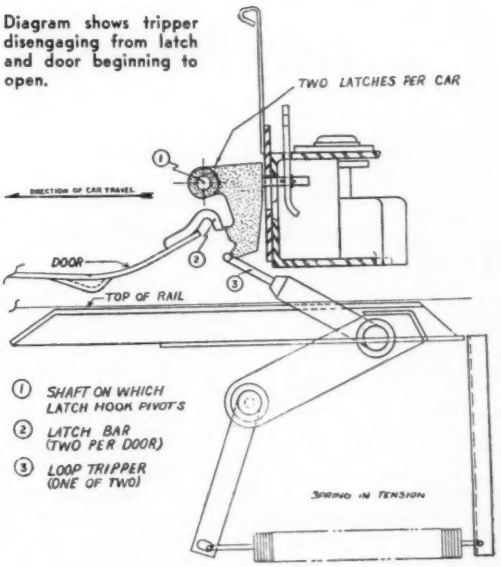


Diagram shows tripper disengaging from latch and door beginning to open.


TWO LATCHES PER CAR
DIRECTION OF CAR TRAVEL
DOOR
TOP OF RAIL
1 SHAFT ON WHICH LATCH HOOK PIVOTS
2 LATCH BAR (TWO PER DOOR)
3 LOOP TRIPPER (ONE OF TWO)
SPRING IN TENSION

Cross-section view in photo above shows position of each hook when locked by one of the "Twin Safety Latches." Detail drawing at right illustrates how each independently operated tripping device mounted between rails engages "Twin Safety Latches" and unlocks doors. Each latch is completely protected by the body structure from obstructions lying along roadway. In the diagrammatic drawing you see that no part of latch casting extends below the door or insill. For this reason, a rock, timber or lump of coal lying between rails cannot accidentally trip either of the "Twin Safety Latches." This can only be done by the special tripping device mounted at the bin.

Sanford-Day IRON WORKS

KNOXVILLE • TENNESSEE

BROWN-FAYRO DIVISION
JOHNSTOWN, PA.

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS
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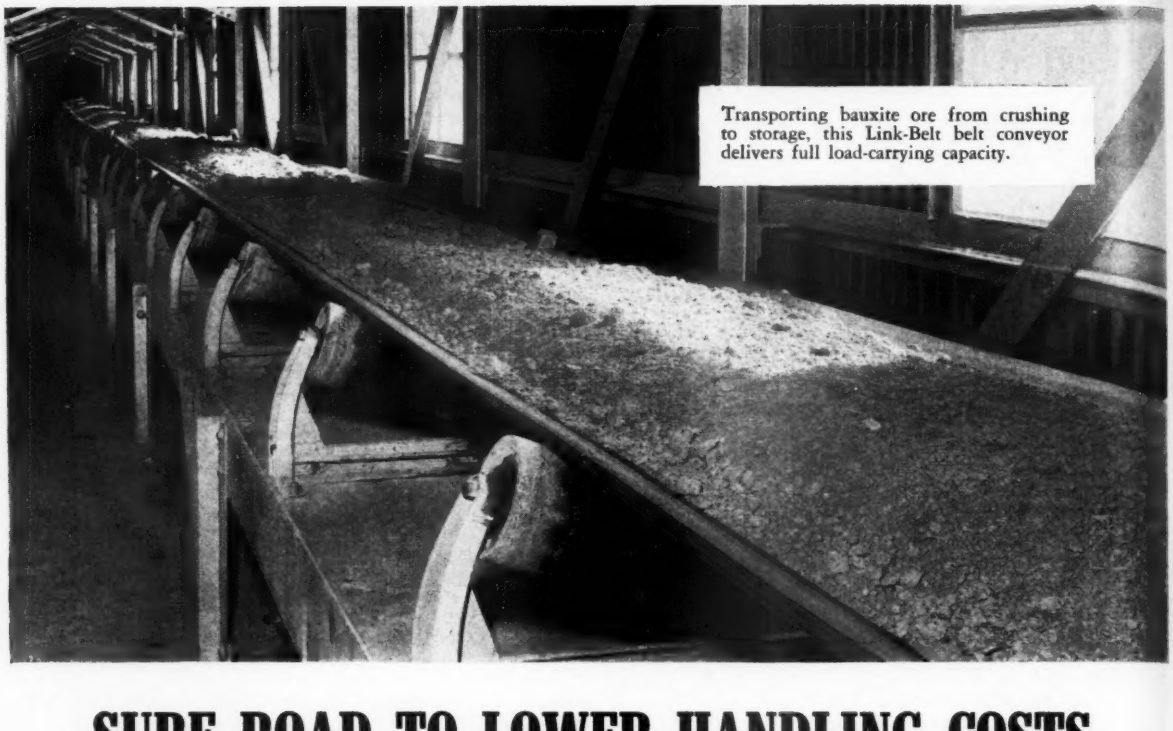
PUMPS - OIL SPRAY SYSTEMS



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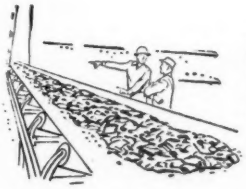

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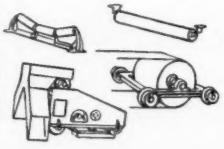

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★ Mining CONGRESS JOURNAL ★

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It Couldn't Happen

INFORMATION CIRCULAR 7694 recently issued by the U. S. Bureau of Mines contains detailed descriptions of five fatal coal mine accidents. They all have in common that the victim was what might be termed an "innocent bystander." In each case it was believed that proper and sufficient safety precautions had been taken. In no case was the victim at fault nor could the blame be laid at the door of any one individual. Instead, it was a series of unusual circumstances that led up to each of these accidents.

These tragedies should serve as a warning to all, metal and nonmetallic mineral mining men as well as coal miners, that the price of safety is continual vigilance; continual attention to details, many of which may seem trivial but which, if neglected, may eventually add up to calamities such as these.

While roof falls accounted for only one of the freak accidents described in the Bureau circular, they are still far and away the number one killer in the mines of this nation. In September we congratulated the Commonwealth of Pennsylvania on the fine work its mining men have done to cut down the number of accidents due to this hazard in the bituminous and anthracite mines of that area. This month, mining men all over the nation are joining in a new all-out drive with the objective of reducing roof fall accidents in metal and nonmetallic mines in the year ahead by at least 50 percent. The National Safety Council will award a Certificate of Achievement to all mines that carry on a minimum of four safety activities during the campaign year and accomplish either (1) a reduction of 50 percent in the frequency of injuries from falls of ground, compared with a similar previous period reported by the mine, or (2) a record of no injuries at all chargeable to falls of ground during the entire campaign year.

The stimulus of competition has long been recognized as an efficient means of building up employe cooperation in a safety program. The increased interest in maintaining a perfect safety record through the addition of the National Safety Council's awards to the Sentinels of Safety and the Joseph A. Holmes awards, should bring a substantial improvement in the safety record of the mining and quarrying industries during the year ahead.

Constant plugging at details has appreciably lowered the accident frequency and severity rates in mining over the years. Every mining company in the country, able to qualify in the contests for these awards, should enter. Every mine worker should become so imbued with the idea of thinking and working safely that at this time next year no one will say regretfully, "It couldn't happen—but it did."

What Price Concentrates

A SPECIAL section of this issue, beginning on page 58 is given over to a complete report on the 1954 Mining Show in San Francisco, September 20-24. From every standpoint—attendance, interest in the program, size and comprehensiveness of the exhibits, etc.—this was the biggest and best mining Convention and Exposition ever held in the West. One of the outstanding features of the program was a series of sessions devoted to the uranium industry. At every one of these the meeting room was filled to overflowing with attentive, interested listeners.

There was general agreement among speakers and listeners that the Atomic Energy Commission has done a remarkably fine job of building up the industry from very small beginnings to its present status. As Jesse Johnson, head of the Commission's Raw Materials Division said, "At the beginning of 1948, there was practically no uranium mining or prospecting . . . (today) . . . we have in the United States at least a $100,000,000 a year uranium industry." This figure includes expenditures for prospecting, exploration, production and construction.

The boom in uranium activity is due to the guaranteed price for uranium ore, provided under the Commission's program. This market provides the incentive for speculation and even for reasonably safe investment.

With ore production doubling every 18 months, there is developing a serious shortage of processing facilities in spite of the expansion programs in progress at existing mills. This was highlighted in a recent address by Carroll L. Wilson, former general manager of the AEC, who posed some pertinent questions as to the solution of the problems.

None of the Colorado Plateau ore contains more than a few pounds per ton of the all-important uranium. To upgrade it requires a chemical type plant sufficiently flexible to treat the many kinds of uranium ore that occur in this area. Such plants may cost from $6000 to $10,000 per ton of daily capacity and a 200 ton-per-day plant is probably the minimum economic size. In short, a custom milling plant for uranium ore represents an investment of almost $2,000,000 plus the cost for ore in process and in storage, ore that might have to come from many small ore bodies.

At present there is no published schedule of prices for uranium concentrates, as there is for ore. Each contract is negotiated separately on the basis of production costs, including amortization, plus a reasonable profit. And such contracts are subject to "renegotiation" should the mill improve its process enough to increase profit, during the life of the contract, beyond what the Government thinks is "reasonable." Facing such conditions of uncertain ore supply, of varying composition, with no guarantee of price level for the concentrates produced, where are the investments to come from that are needed to build and operate custom mills?

Mr. Wilson's view of the problem was stated forcefully as follows: "The AEC can do one of two things. It can build its own mills and run them on a cost-plus-fixed-fee basis, hardly the right direction to be heading in 1954. The declared AEC policy is to shed functions the Government has been performing, rather than to expand old ones or pick new ones.

"The alternative is go the other way. Let private initiative lick the problems of milling and give it proper incentives to do so. The only incentive needed is a simple one and the same one used in mining—a schedule of published prices for concentrate—firm until 1962."

The Connecting Link in Percussion Drilling

Beginning in this issue, a series of articles on how to get the most out of hollow drill steel will be presented. These are based on the papers delivered at the Drill Steel Symposium at the American Mining Congress 1954 Mining Show in San Francisco. Prepared by recognized authorities in the metallurgical field, they will include a wealth of valuable material for all users of percussion drilling equipment.

The Problem—What—Why—How?

By B. F. SHEPHERD

Chief Metallurgist
Ingersoll-Rand Co.

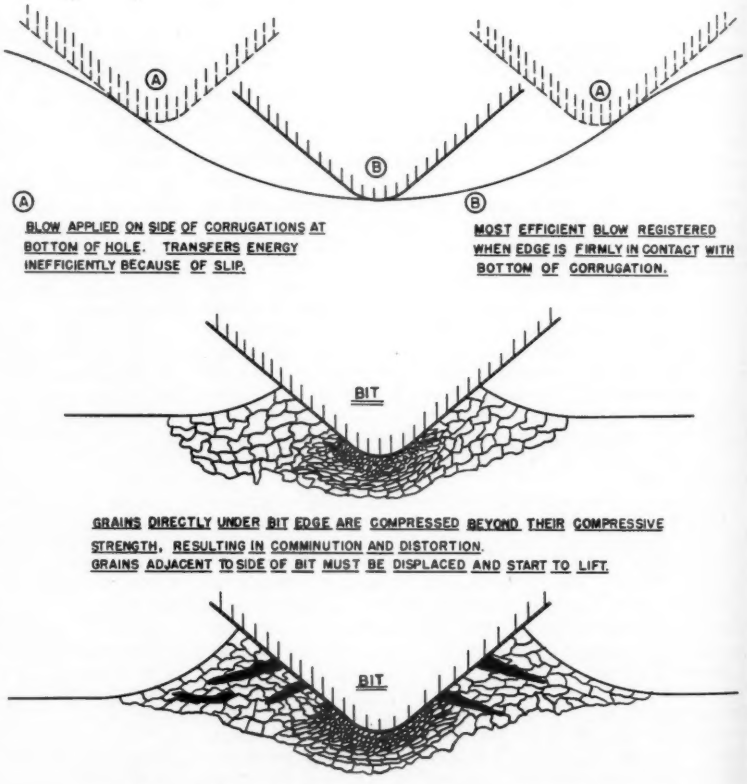
CONSIDERABLE progress has been made in drilling holes in rock by percussion methods since machine drilling was started about 1860. It would seem that problems in this field would be minor or non-existent. An ostrich with its head in the ground sees no danger and unless we are realistic we will see no problems. The advances in jet piercing, rotary drilling, vibration disintegration, etc., alert us to the necessity of devoting research time to the fundamentals of percussion drilling if we expect to maintain it in its proper place.

Drilling rock by hammering on one end of a steel bar and shattering rock at the other end is so elemental that the problem seems simple. The chain of rock drill, drill steel and bit is no stronger than the weakest of these three.

Drill manufacturers may improve the power of the rock drill, bit manufacturers the cutting capacity of the bit, but unless the drill steel which connects these two is also commensurably improved the drill and bit developments will be wasted. This symposium concerns itself with drill steel, the connecting link and we start off by asking; what is the problem?

The problem, scientifically, is the transmission of energy produced by rapidly repeated impacts through long slender columns and effectively utilizing it at the other end to shatter rock.

We should, therefore, study the means by which energy is transmitted through steel bars and the mechanism by which this energy is converted to work. This includes, of course, the study of the disintegration of rock by percussion impact. The increasing use of long hole drilling and the use of detachable bits requires a study of the interference of the energy wave by steel couplings, joints, etc. These studies will represent basic data which must be accumulated and utilized. In


A
B
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A
BLOW APPLIED ON SIDE OF CORRUGATIONS AT BOTTOM OF HOLE. TRANSFERS ENERGY INEFFICIENTLY BECAUSE OF SLIP.
MOST EFFICIENT BLOW REGISTERED WHEN EDGE IS FIRMLY IN CONTACT WITH BOTTOM OF CORRUGATION.
BIT
GRAINS DIRECTLY UNDER BIT EDGE ARE COMPRESSED BEYOND THEIR COMPRESSIVE STRENGTH, RESULTING IN COMMINUTION AND DISTORTION.
GRAINS ADJACENT TO SIDE OF BIT MUST BE DISPLACED AND START TO LIFT.
BIT
FURTHER FORWARD MOVEMENT OF BIT CAUSES FURTHER COMMINUTION, FISSURING ON SOME ROCKS, AND FRAGMENTATION OF AREA ADJACENT TO SIDE OF BIT.

Mechanism of rock fracture by percussion drill bit

addition, we have the more immediate practical problems of selecting types of drill steel, connections, heat and mechanical treatments which must be given every day attention if we are to effectively utilize the available tools.

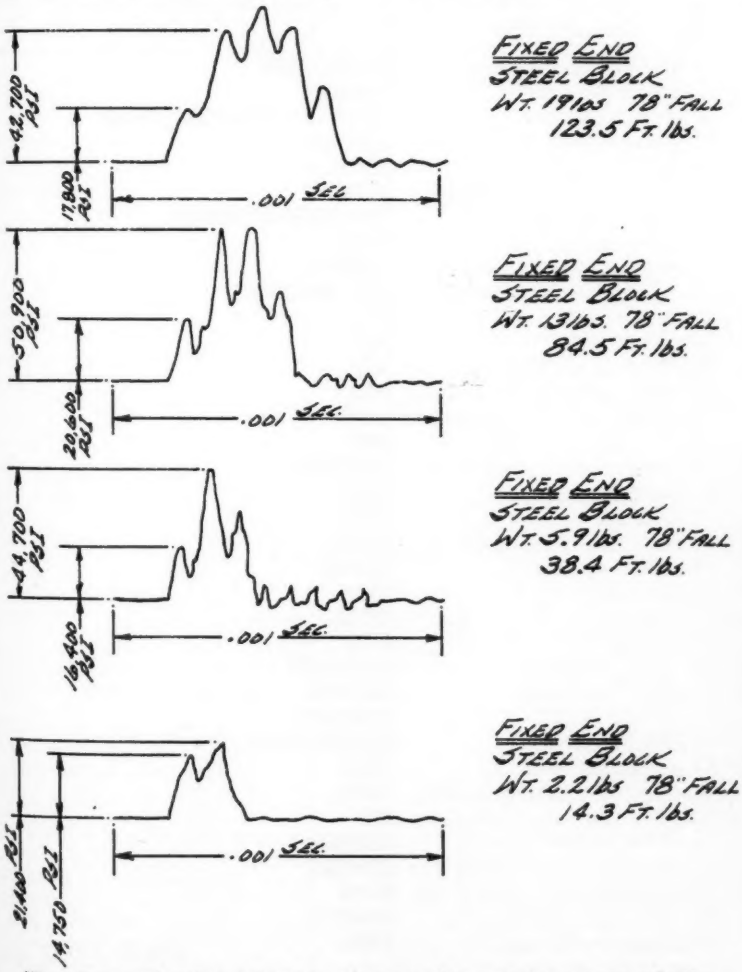
The increasing tendency to use smaller gage bits is necessarily accompanied by use of smaller sections of drill steel and/or increase in size of hole in the steel. This presents two major considerations; first, the change in section modulus of the long slender columns and, second, the reduction of area of the surface of the shank being hit by the rock drill piston. The first increases the bending tendency with loss of energy, the second increases the tendency to upset the shank because of the higher intensity of loading per unit area. Increasing the hardness of the drill steel shank to resist upsetting brings in the problem of spalling of piston striking ends.

The increasing use of drills using larger diameter drill steel of the tubing variety requires hardnesses high enough to resist permanent set under the bending moments and low enough to be machinable.

Drill rod transmits energy from percussion drill through bit to rock

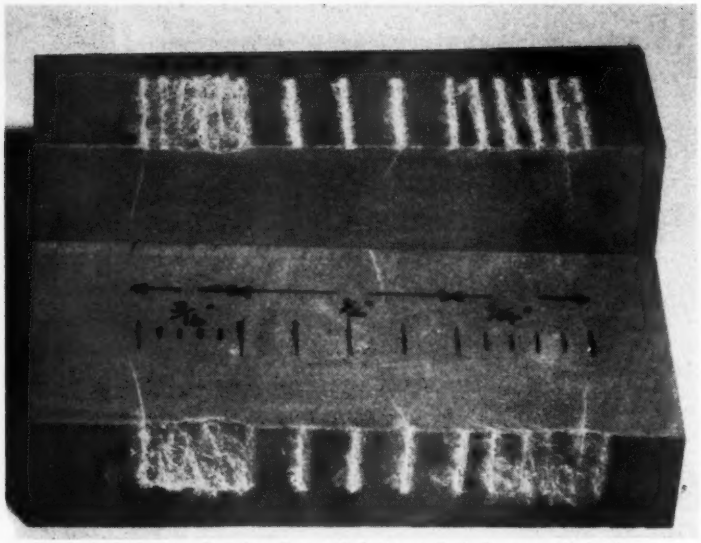
The transmission of energy through long slender columns can be studied by use of SR-4 strain gages and high speed oscillograph photographs. When the rock drill piston strikes the drill steel a compressive wave is set up which traverses the drill steel with very little loss in energy, excepting at joints where the energy loss is a function of the type of connection. The velocity of this compressive wave is very high, 16,280 fps. or less than 1/2000 of a second to travel the length of the ordinary drill steel.

The utilization of the energy of this stress wave is very inefficient due to the uncontrollable contact of the bit with the rock. If the bit is held away from the rock, the compressive wave is reflected as tension from the bit end. If the bit is tight against a perfectly rigid rock, the compressive wave should theoretically be reflected as compression but this condition practically never occurs. When the first



Wave form produced in drill rod by various striking energies at same velocities

Bottom of a drill hole shows comminution under drill bit edges, fragmentation of wedges in between and center button



Vertical cracks developed in Texas Pink Quartzite below comminuted areas on blows with ¼-in. or more spacing

compressive wave arrives at the bit end it is reflected as tension, whether or not the bit happens to be in contact with the rock. The bit moves forward under the impact and digs into the rock. The wave travels back and forth through the bar until it is dissipated.

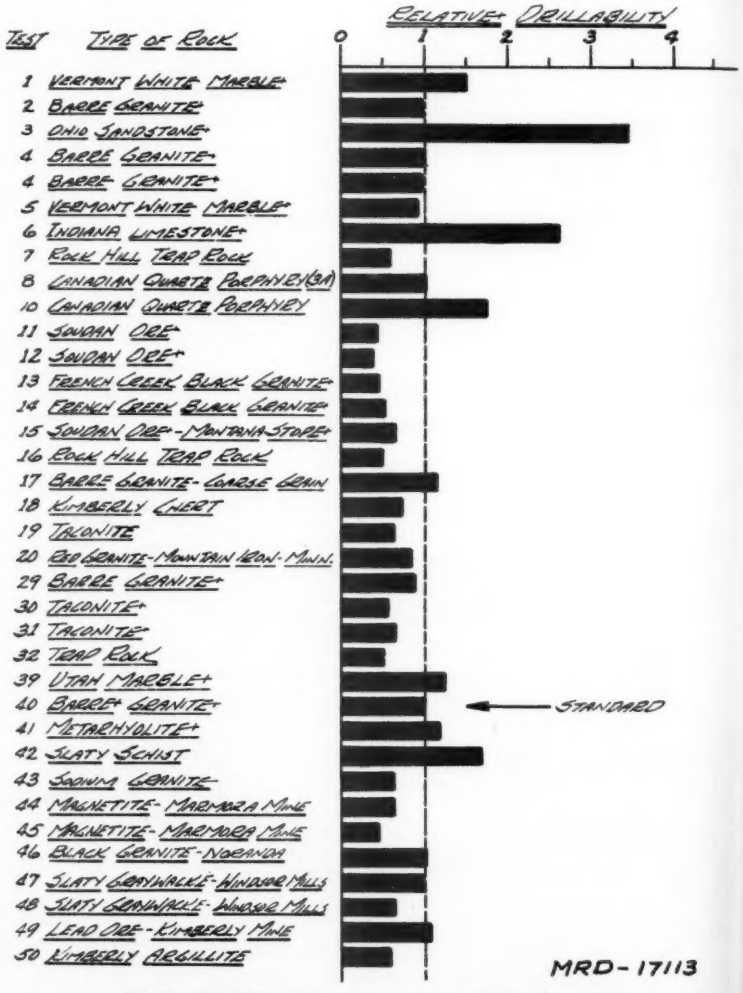
The higher striking energies of larger drills do not materially increase the maximum value of the stress wave but they do maintain this stress over a longer time period. This is illustrated by the wave form produced by various striking energies at the same velocity. In these cases the end of the short drill steel was in intimate contact with a steel block. These higher striking energies usually break more rock because they provide sufficient force over a longer time period so that rock continues to be broken until the stress level falls below the ultimate strength of the rock.

No Standard Rock

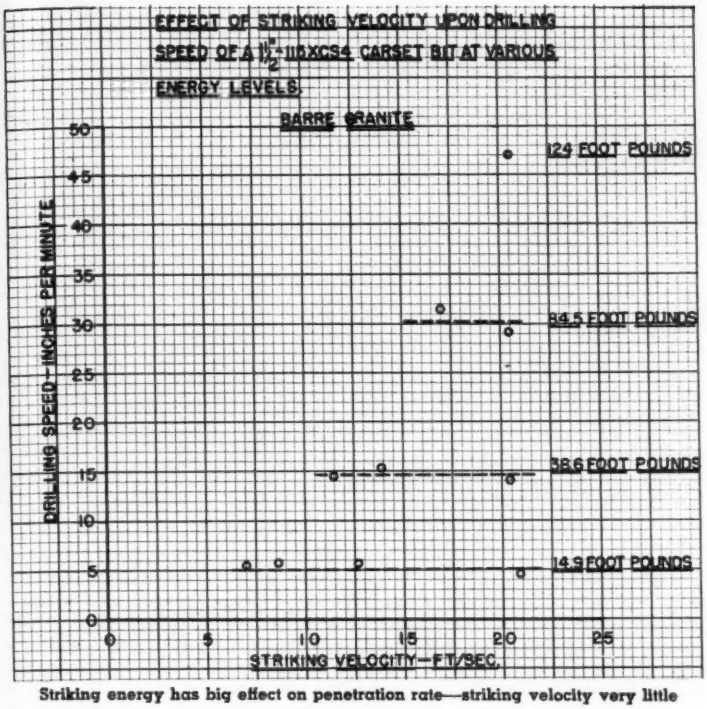
There is no such thing as a standard rock so the mechanism of shattering the rock by impact varies according to the exact type. In general, rocks fail by a combination of comminution and fragmentation. The compression of the rock or rock grains directly under the cutting edge subjects these grains to compressive stress above their strength and they disintegrate into fine powder or comminute. The grains directly under these are also compressed and shearing stresses are induced in the rock. Brittle materials are relatively weak in shear and the the material in this area is broken. Fragments separate due to these stresses, the size of the particles being a function of the toughness and strength of the rock.

Due to the rotation of the drill bit, approximately 30° between blows, the area being damaged is wedge-shaped, with the arc becoming greater as the diameter of the bit increases. It becomes increasingly difficult, therefore, to break out the material at the side wall as the gage diameter increases and the bottom of the hole has a corrugated appearance. The contact of the bit with the rock is affected by this uneven surface and effective transmission of the energy is greatly reduced. This can be illustrated by studying the effect produced by use of a chisel bit on a flat surface, varying the distance between blows.

An apparatus whereby single impact blows of uncontrolled energy levels with the approximate striking velocity of a rock drill piston can be applied to rocks, was used on two specimens. One, No. 59 is a pink Texas quartzite, the other No. 60, a ganister from Western Pennsylvania. Single blows of 39-ft lbs (approximate strik-



Relative drillability of various rocks. Barre Granite = 1.00



Striking energy has big effect on penetration rate—striking velocity very little

ing energy of 40-lb Jackhammer) were applied on the spacings shown.

It will be noted that the blows made with ¼ in. or more spacing not only comminute the rock under the cutting edge but actually cause a vertical fissure to form. These fissures do not form on the 3/16-in. spacing because the rock starts to break towards the area damaged by the preceding blow and the energy is dissipated before it can be effectively used. A ½-in. slab was removed from this face and cut vertically. The vertical fissuring was so pronounced that the sample, approximately 4 in. sq by 12 in. long was reversed 180° and another set of tests made. This sample was then trimmed and sectioned vertically, both sections are shown on page 30.

While this action will not hold for all rocks, it illustrates the damage that can be done by an efficient application of impact loading. Many contradictions exist in drilling rock. Some relatively soft, tough rocks are more difficult to drill than harder, stronger rocks. Similar geological formations in close proximity have shown marked differences in "drillability." Many mine personnel take pride in describing their rock as being much harder to drill than other similar types in the same camp.

We have developed both a laboratory and a portable apparatus for determining the drillability of small samples of rock divorced from the many other factors which exist in the field. These tests are usually made with a 1½-in. Carset bit and the drillability in inches per minute is reported as the relative drillability of Barre Granite, a material commonly utilized for development of rock drills. The results of laboratory tests compare closely to the relative drillability of the same rocks drilled with a J40 Jackhammer. The agreement between these two methods, as shown in the following tabulation, gives us the assurance necessary to predict the drillability of samples received from the field.

Relative Drillability Comparison
Barre Granite=1.00

Rock	Laboratory	J40
Metarhyolite - Canada	1.18	1.01
Magnetite-Marmora Mine	.625	.648
Black Granite-Canada	1.01	.905
Slaty Graywacke-Canada	.645	.695
Granite-Knoxville, Tenn.	1.018	1.178
Pink Quartzite-Texas	.754	.713

This type of equipment lends itself to exploring various factors which affect rock drill design. The above chart shows how the drillability of Barre Granite and a hard trap rock are affected by striking energy and striking velocity. It will be noted that striking energy is the predominant factor affecting drilling speed in both of these rocks and that increases in striking velocity for the same striking energy have no effect.

Material, Treatment and Design for Drill Rods

By T. E. NORMAN

Metallurgical Engineer
Climax Molybdenum Co.

THE drill rods used in percussion drilling of rock have not improved in quality at the same rate as the rock drills used at one end of the rod or the carbide insert bits used on the other end. The primary cause of rod failure is breakage from fatigue cracks, which develop as a result of the repeated stress cycles which are rapidly imposed on the rod. Secondary causes of failure include upsetting or bending of the rod beyond its elastic limit, spalling or chipping of the shank end or threads and wear at threads or press fit connections. While these secondary causes of failure certainly merit attention, our primary concern at the present time is the prevention of fatigue failures.

Progress made in the elimination of fatigue failures was not achieved by the development of a "super" steel, a "super" heat treatment or by other radical changes. In practically all cases the improvement was accomplished by a combination of factors which included improvements in mechanical design and surface treatment along with close attention to steel quality, composition, machining and heat treatment. A close coordination between these factors generally brought about a step by step improvement in fatigue life of the part.

Principal factors to be considered in a study of fatigue failures in drill rods are as follows:

(1) Relatively high alternating stresses
(2) Hardness and tensile strength
(3) Design
(4) The as-rolled surface
(5) Composition
(6) Heat treatment
(7) Damping capacity of the steel
(8) Surface treatments
(9) Water cooling and corrosion fatigue

The above factors will now be discussed briefly.

(1) ***Relatively high alternating stresses.*** The high incidence of early fatigue failures in drill rods is a good indication that the imposed stresses are rather high. Instantaneous stress measurements have indicated that peak surface stresses are about 40,000 to 60,000 psi under good drilling conditions and may exceed 100,000 psi under severe operating conditions. With such repeated stresses as these, it will require close and intelligent control over the design, metallurgy and fabrication of drill rods to obtain good fatigue life.

(2) ***Hardness and tensile strength.*** The tensile strength of a steel in psi is, on an average, about 500 times its brinell hardness. The fatigue limit, that is, the stress below which steel will not fail under repeated loading, is approximately 45 to 50 percent of the tensile strength. This ratio drops slowly as hardness increases, but more important, the sensitivity to stress raisers such as notches or section changes increases with increasing hardness. Consequently, if the harder alloy steels are to be used to advantage in drill rods, it is even more important to reduce stress raisers in these rods than it would be in the softer carbon steel rods.

It appears that little, if any, additional endurance strength would be obtained from drill steel by raising its tensile strength above 200,000 psi, that is, about 400 brinell. This statement should not be applied, however, to rods which are given special treatments which put their surface skin under a residual compressive stress.

(3) ***Design.*** While it would be extremely desirable to avoid any shoulders, threads or other stress-raising section changes on a drill rod, it is seldom possible to accomplish this. The best we can generally do is to apply some of the well known rules regarding these section changes. Photoelastic stress studies of transparent plastic models are very helpful in studying the influence of section changes.

Well known factors in design which help to lower stress concentrations are long radii of fillets at section changes, absence of roughness, grooves and sharp shoulders in machining, the use of stress-relieving undercuts at appropriate points, and close dimensional tolerances in threaded connections.

A further consideration in section changes involves the care or skill used in forging and upsetting of the drill rods. Laps in the surface, irregularities in the center hole and pits caused by scale adhering to the heated steel should be avoided.

(4) ***The as-rolled surface.*** Generally the as-rolled or as-forged surface

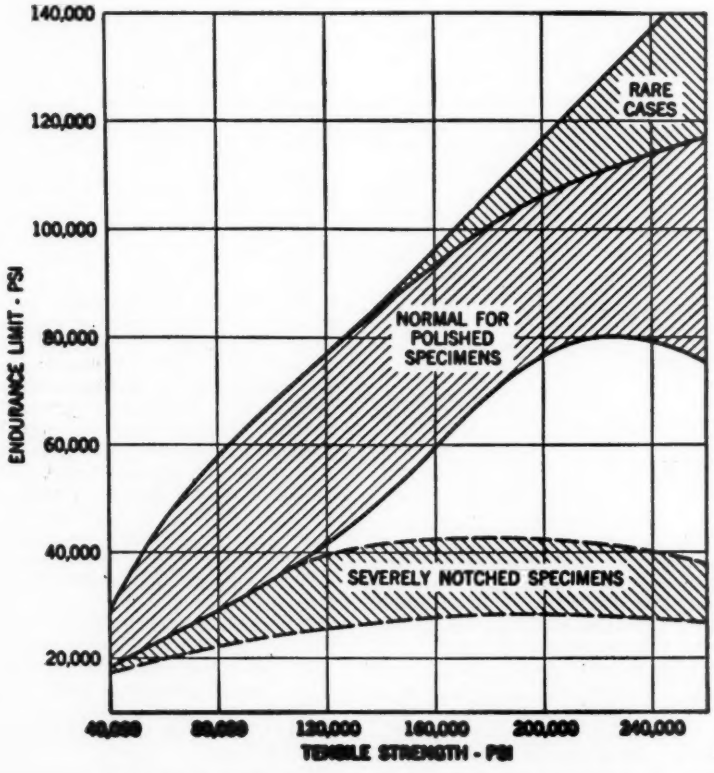
Decarbonization below "As-Rolled" Surface (Mag x 100)

of drill rods is not removed, except at threads or friction-fit connections. This surface always contains a large number of local pits, small notches and other irregularities which act as stress-raisers. It is also decarburized so that the steel is generally in a relatively soft and weak condition at its extreme surface. This applies to both the surface at the center hole and at the outside of the rod.

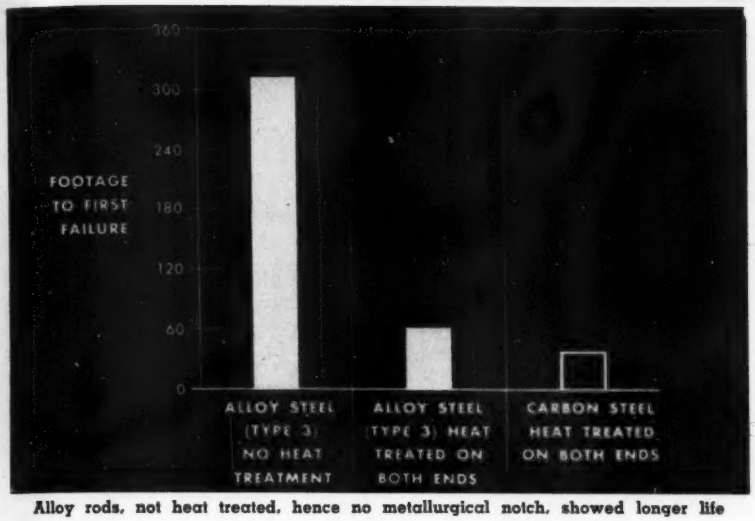
Since, at the present time, it appears to be economically impractical to remove this as-rolled surface, we shall have to try to correct its defects as well as possible by the use of special surface treatments.

(5) ***Composition.*** A rather wide range of chemical compositions has been used to date for hollow drill rods. While much of the present drill rod production is made from unalloyed steel, there has been a definite trend towards the use of alloy steel compositions. The principal function of the alloy additions is to produce a higher as-rolled hardness, which normally will also improve fatigue resistance. Full advantage from these alloy additions will not be obtained, however, unless the weaknesses in design, heat treatment and mechanical treatment of the rods are also corrected.

The preference for any particular alloy combination to obtain the desired hardness in drill rods is based largely on secondary considerations which may include such factors as economy, availability, wear resistance, ease of annealing, machining or heat treatment, free scaling characteristics in rolling or forging and the metallurgical characteristics of the decarburized skin. For drill rods at any particular hardness value, the relationship, if any, between fatigue strength and chemical composition is still obscure. More work needs to be done on this problem.



Relation between Endurance Limit and Tensile Strength



Alloy rods, not heat treated, hence no metallurgical notch, showed longer life

(6) ***Heat treatment.*** Heat treatment has generally been necessary on the ends of drill rods to eliminate the structure obtained on forging or annealing of these ends. It is also usually necessary to heat treat to insure that the ends will have the correct hardness to resist upsetting or spalling.

The great disadvantage of heat treating the ends of drill rods is that this heat treatment introduces a metallurgical notch in the transition zone between the heat treated and as-rolled portion of the rod. This notch must be eliminated before good fatigue life can be expected from the rods.

While this metallurgical notch can be partially neutralized by advancing the steel into the furnace for a short time prior to quenching, this involves human behavior which is likely to be variable. It would be more desirable to eliminate these notches entirely by giving the rods full length heat treatment. Another way out, studied by Borcherdt and his associates at Anaconda, is to use alloy steel with sufficient as-rolled hardness and do no forging, annealing or heat treating on the ends of the rods.

In many rods, fatigue failures occur most rapidly in the heat treated portion of the rods, particularly at threads or near shoulders. The metallurgical structure which will best resist these fatigue failures at notches deserves more consideration. While we need further study on this, the limited amount of data now available indicates that the structure developed by air quenching is less notch sensitive in drill rods than the structure developed by an oil quench and draw to the same hardness level.

(7) ***Damping capacity of the steel.*** The damping capacity of the various steels used in drill rods has not been given the attention it probably deserves. A steel with high damping capacity will absorb a portion of the blow from the piston hammer and convert it into heat. This, of course, reduces the efficiency of drilling and probably slows up the drilling speed.

We know that in general harder steel will have lower damping capacity and should, therefore, drill rock faster.

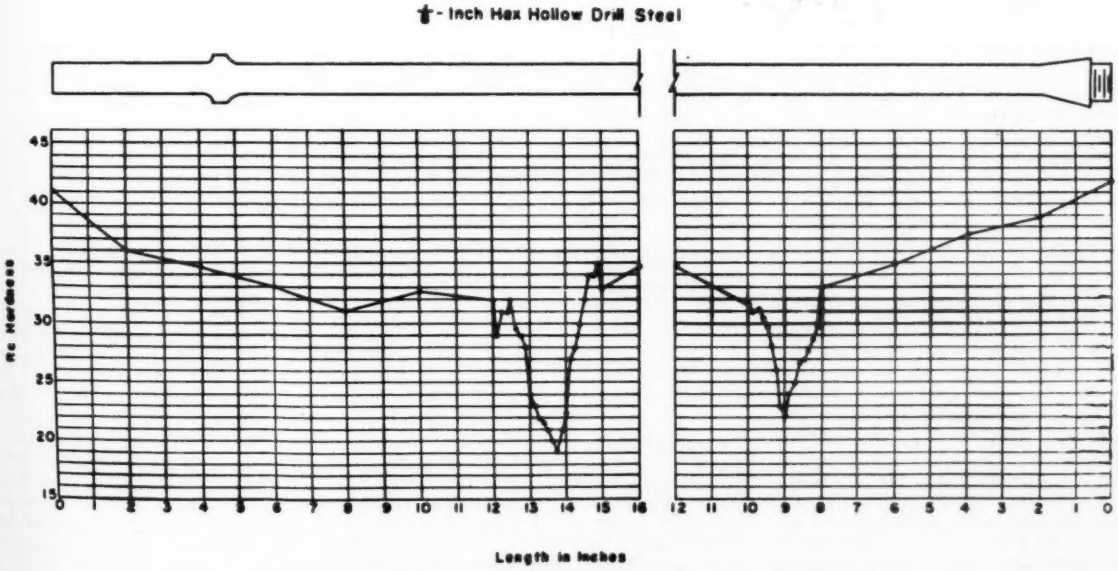
Table 1—Drilling Rates of Carbon and Alloy Steel Rods in Oil Shale*

Type of Rod	*No. of Rods Tested*	*Ave. Drilling Rate, In./min*
Carbon steel	5	19.3
Alloy steel, several types	14	24.5 to 26.7

* From the data of Sipprelle and Ballinger.

There appears to be a relationship between the damping capacity of steel and its fatigue properties. However, this relationship is not yet very clear, so we can only hope that drill rods with low damping capacity will also have good fatigue resistance.

(8) ***Surface treatments.*** Probably the most promising possibilities for better fatigue life in drill rods lie in the use of special surface treatments. It is essential to realize that practically all fatigue cracks start at either the outside surface of the rod or at the center hole. The outside surface is most susceptible to initia-



Hardness test shows "Metallurgical Notch" at end of heat-treated part of rod

Table 2—Effect of Shot Peening on Fatigue Strength in Reversed Flexure of Various Types of Steel*

Metal	Endurance Limit for 10 million Cycles of Stress (psi)	
	Not Peened	Peened
4032 Steel, carburized	100,000	150,000
9420 Steel, carburized	100,000	153,000
1020 Steel plate	34,000	38,000
1050 Steel plate	37,000	47,000

* From the data of Prof. H. F. Moore.

tion of cracks since it is usually more highly stressed (by bending) than the surface of the center hole. The crack starts as a result of the repeated tensile stresses. If high residual compressive stresses are induced in these surfaces by some means, then the imposed tensile stresses are more or less neutralized, so there is much less chance for a crack to start.

Fatigue failure in drill rod thread

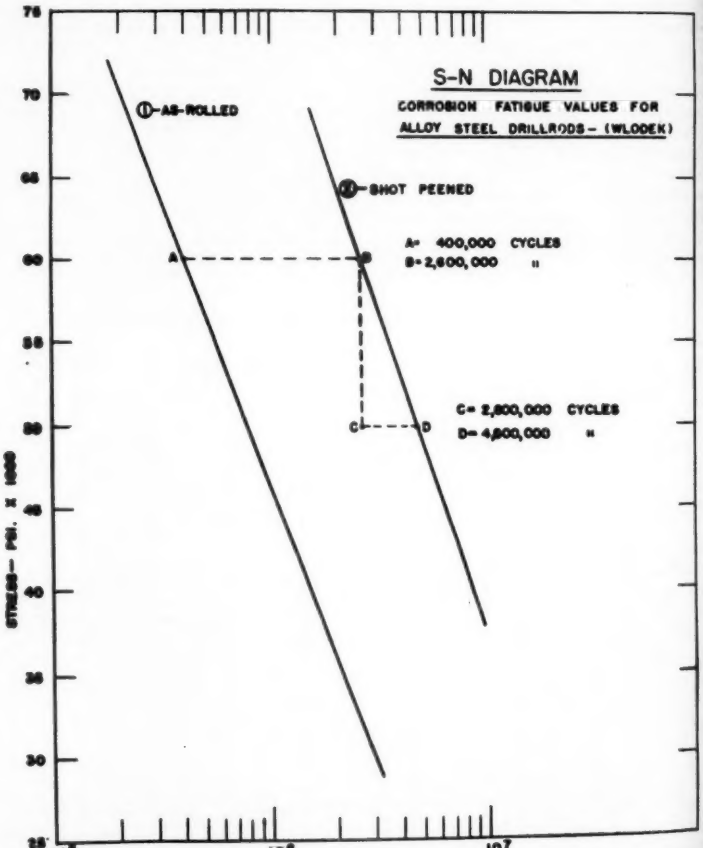
Shot peening has provided one of the most successful mechanical methods of putting surfaces under residual compressive stress. Another method involves cold rolling of the surface, particularly in threads, fillets and undercuts. Still another method involves pre-stressing of the part with a tensile stress sufficient to cause plastic flow at the notches. When this applied pre-stress is removed, the deformed metal around these notches is left in residual compression, thus increasing fatigue resistance at these points.

Metallurgical means of putting the surface under compression involve skin hardening treatments such as carburizing, nitriding, flame hardening and induction hardening. Close control over such treatments is essential to their success. A nitrided case produces high surface compression but appears to be too brittle to be applicable to most drill rods. Carburizing, on the other hand, shows considerable promise. One of its advantages lies in the fact that it can be applied to the center hole as well as to the outside surface of the rods. Carburizing also has the advantage of providing a very wear-resistant surface at the threads or at friction fit connections of drill rods.

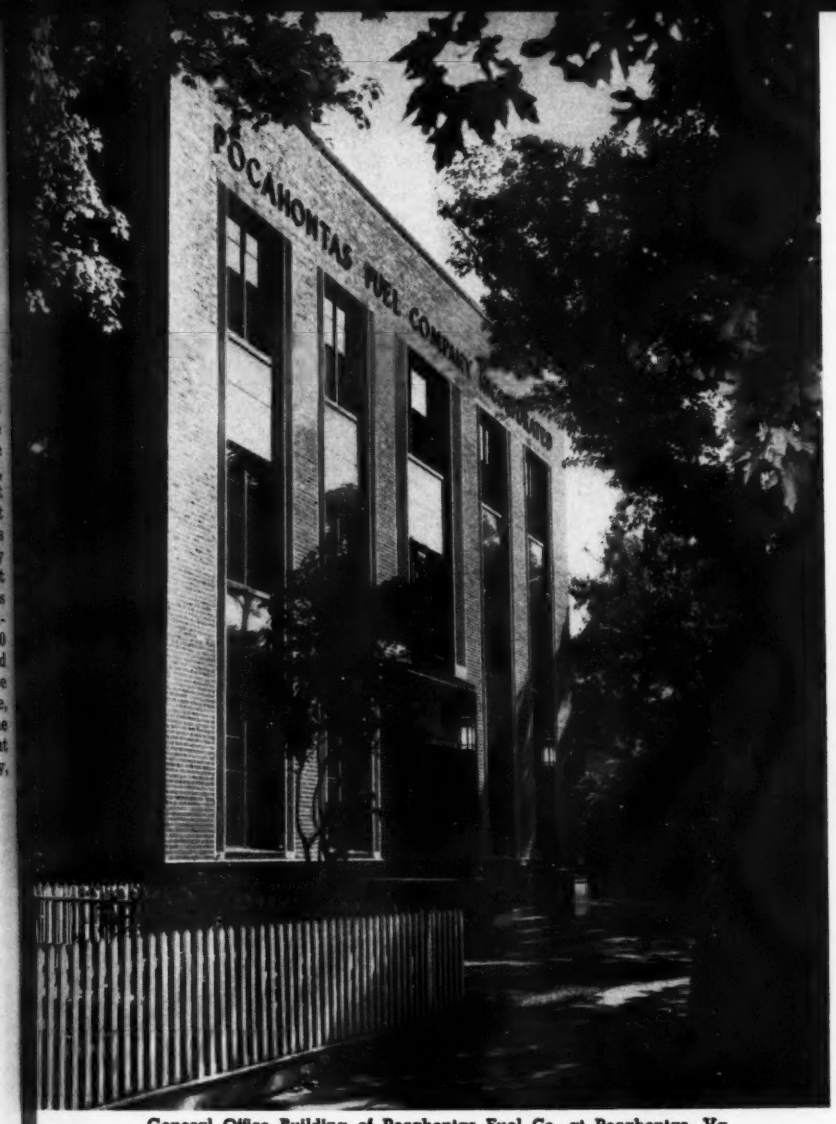
For maximum fatigue resistance, a combination of carburizing, followed by shot peening, appears to be most interesting.

(9) ***Water cooling and corrosion fatigue.*** Most data on fatigue properties have been obtained under dry conditions, where the effect of water cooling and its influence on corrosion fatigue was absent. Since drill rods usually operate in contact with water, it would be most interesting to see what influence water might have on the fatigue life of drill rods. Wlodek at the Canadian Department of Mines has done an outstanding job of studying this problem. His findings indicate that water cooling tends to increase the life of drill rods at high alternating stress levels but at the same time corrosion fatigue acts in its typical manner so that there is no minimum stress level (endurance limit) below which the rods will have indefinitely long life. It appears, therefore, from Wlodek's work, that the practice of wet drilling is not shortening the life of most drill rods and in many cases it may actually improve this life. This statement applies to rods having a life of less than five hr of drilling which is equivalent to between 350,000 and 600,000 cycles of peak stress. If we should ever succeed in extending the service life of these rods to 50 hr or more, then corrosion fatigue will enter the picture and prevent the attainment of indefinitely long life. Probably,

(Continued on page 101)



S-N diagram for water cooled Alloy steel rods



General Office Building of Pocahontas Fuel Co. at Pocahontas, Va.

Progressive Mining Company Matches Mechanized Operation Underground with Mechanized Office Operations to Speed Work and Save Money

A Modern Mine Accounting and Statistical Office

By WM. A. FULLARTON
Special Assistant to the President
Pocahontas Fuel Co. Inc.

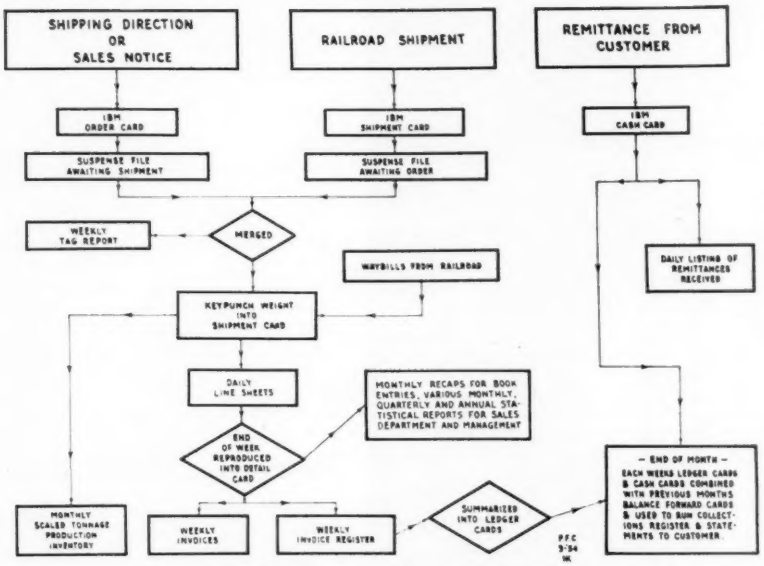
THIS is the story of how a large bituminous coal mining company has modernized its accounting and statistical operations paralleling the mechanization and modernization of its mining and preparation facilities.

The Pocahontas Fuel Co., Inc. is the pioneer producer of premium Pocahontas Seam coals in southwestern Virginia and southern West Virginia. Since shipments of coal from its first mine at Pocahontas, Va., began in 1883, over 270,000,000 tons have been distributed by railroad cars and ocean-going ships to all types of consumers in all parts of the United States and the world. An equal tonnage in reserves of this high-quality, low-volatile coal is available to serve its customers in the future.

General offices of the company are located in Tazewell County at Pocahontas. The head sales office is located in Cleveland, with other sales offices in New York City, Chicago, Cincinnati, Detroit, and Richmond, Va. The New England Division has headquarters in Salem, Mass.

Mine Modernization Complete

The company is just completing the major phase of its mine mechanization and modern preparation plant construction program which will provide an annual capacity of over 8,000,000 tons of high grade metallurgical, industrial, power plant, and domestic fuel. Early in 1951 the multimillion dollar Itmann mine and preparation plant, equipped with the latest underground mechanical mining equipment and the most modern preparation plant, was put into production. In 1954 the Amonate and Bis-


SHIPPING DIRECTION OR SALES NOTICE
RAILROAD SHIPMENT
REMITTANCE FROM CUSTOMER
IBM ORDER CARD
IBM SHIPMENT CARD
IBM CASH CARD
SUSPENSE FILE AWAITING SHIPMENT
SUSPENSE FILE AWAITING ORDER
WEEKLY TAG REPORT
MERGED
WAYBILLS FROM RAILROAD
DAILY LISTING OF REMITTANCES RECEIVED
KEYPUNCH WEIGHT INTO SHIPMENT CARD
DAILY LINE SHEETS
MONTHLY RECAPS FOR BOOK ENTRIES, VARIOUS MONTHLY, QUARTERLY AND ANNUAL STATISTICAL REPORTS FOR SALES DEPARTMENT AND MANAGEMENT
END OF WEEK REPRODUCED INTO DETAIL CARD
— END OF MONTH — EACH WEEKS LEDGER CARDS & CASH CARDS COMBINED WITH PREVIOUS MONTHS BALANCE FORWARD CARDS & USED TO RUN COLLECTIONS REGISTER & STATEMENTS TO CUSTOMER
MONTHLY SCALED TONNAGE PRODUCTION INVENTORY
WEEKLY INVOICES
WEEKLY INVOICE REGISTER
SUMMARIZED INTO LEDGER CARDS
PFC 9-54 W

Accounts Receivable and Sales Flow Sheet

hop mines were completely mechanized underground and new cleaning plants were added for industrial coals. Each of these mines has a productive capacity of over 2,000,000 tons annually.

The mine mechanization and modernization program has been carried out under the direction of A. R. Matthews, president, and A. V. Sproles, vice-president in charge of operations. Earl C. Robertson is vice-president in charge of sales. The mechanization of the accounting and statistical functions was accomplished under the direction of Holly W. Sphar, vice-president and secretary, and Adolph Butze, Jr., treasurer, by Richard L. Chambers, supervisor of the I. B. M. Department, and his staff.

Primary purpose behind the company's program of modernization of its accounting and statistical operations was two-fold. First, to provide management with prompt, accurate, and economical reports and analyses covering the many varied transactions arising from the mining, processing, and sale of coal. Second, to give Pocahontas Fuel Co. customers and employes the clearest and best possible statements of their accounts.

At present the mechanized accounting department is preparing all invoices, keeping accounts receivable, making statistical reports for salesmen, handling coal production and coal inventory reports, accumulating coal distribution statistics, preparing payrolls and accompanying governmental reports and handling cost distribution.

Behind the mechanized mine, the company has modernized its accounting and statistical operations

Mechanization Is Begun

The first step toward accounting mechanization took place in the company's New York City office in 1945 with the installation of a punched card system for invoicing and accounts receivable using International Business Machines equipment. An important factor in the decision to change to the new system was recognition by management that many repetitive handlings of the same information were constantly recurring, involving many costly clerical manhours.

For example, in a year's time one customer might have been invoiced on a weekly basis 52 times and given a monthly statement of his account 12 times, making a total of 64 times during the year that the customer's name and address were repeated on invoices or statements. Under a manual method, over 3000 key depressions would have to be made by a typist for only a three-line address, each writing being subject to the element of human error and demanding additional time for manual verification.

Under the punched card system a one-time operation by the keypunch operator would establish a set of name and address cards. These same cards would be used over and over again, year after year, to mechanically print the name and address on invoices and statements at the speed of one hundred *lines* per minute. Multiply this one factor alone by thousands of customers and it is evident that a big saving in time and accuracy could be effected.

Customer Accounting

At the outset of the new system, customer account numbers were assigned alphabetically. An expansion factor was left in order that new customers could be assigned without losing the alphabetic sequence. The importance of the alphabetic sequence is most apparent in establishing a uniform order of ledger accounts for easy reference.

Basically, the same system of invoicing and accounts receivable is still in effect as was originally installed in 1945. However, late in 1952 the company's general offices were moved to Pocahontas, Va., where the I. B. M. Department is situated in a modern office building. This move made possible the further mechanization of clerical work incident to shipping and invoicing operations.

As customer orders are received in the I. B. M. Department from the various district sales offices, the customer account numbers and numeric coding for grade, treatment and mine are assigned to each order.

A card is then keypunched for each order with customer account number,

ship-to number, order number, price, grade of coal, number of cars, and sales district. These cards remain in a suspense file until shipment is made against the orders in the file.

Shipments Telephoned In

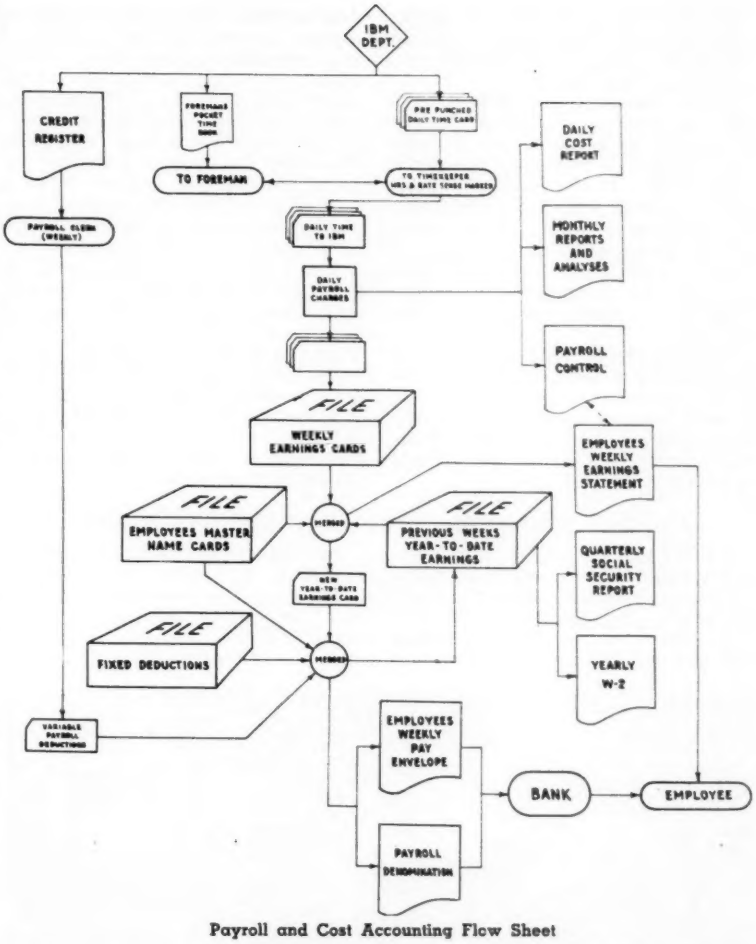
A telephone report of shipments is made twice daily by the coal inspector at each mine. This report is transmitted to the I. B. M. Department by the Shipping Department. From this shipping report a card is then keypunched for each railroad car with ship-to number, order number, railroad car number and initial, mine, and grade of coal.

The shipment cards are then mechanically matched against the cards in the order suspense file by order and ship-to number at a rate of 240 cards per minute. Customer account number and district number are then automatically punched into the shipment cards from the matching order cards.

The shipment cards remain in another suspense file until the coal is weighed. As the waybills come in, the shipment cards are pulled from the suspense file and the hundredweight is keypunched into the shipment cards from the waybills.

A daily report of shipments by rail is then automatically prepared for each sales district by passing the punched cards through the accounting machine. The report shows each car of coal moving into the district, the order number covering the shipment, the customer name, the grade and the weight of the coal. Similar reports are prepared for tidewater and lake shipments.

At the end of the week the shipment cards are processed through the electronic calculating machine, which converts the hundredweights to tons, and extends the tons times the price, at the rate of 100 cards per minute. The shipment cards are then arranged in customer account number order in the electronic sorting machine at the rate of 650 cards per minute. They are then matched automatically with the master name and address cards, placed in the accounting machine and



Payroll and Cost Accounting Flow Sheet

POCAHONTAS FUEL COMPANY, INCORPORATED
SALES DEPARTMENT

RECORD OF COAL WEIGHED AND SHIPPED TO CINCINNATI TERRITORY — DATE 91554 — SHEET NO. 26

ORDER NO.	SOLD TO	DESTINATION		CAR	FORM M DATE	DATE LOADED	MINE	WEIGHT POUNDS	F.O.B. PRICE	REMARKS
8N212	BECKLEY CO	RUSHVILLE IND	N&W	61236	0903	901205152		1065		
7N106	BLACK HILL COAL CO	COLUMBUS 6 OHIO	N&W	62888	0903	901211022		1077		
9N046	BRIGHT BROS CO	S LEBANON OHIO	N&W	62239	0904	903148012		1138		
8N096	CUT RATE COAL CO	URBANA 4 OHIO	N&W	84864	0905	903211012		1076		
6N004	COOPER COAL	INDIANAPOLIS IND	N&W	86116	0903	831211032		1002		
9N016	DOUGLAS COAL CO	CINCINNATI 7 OHI	N&W	61820	0905	903211032		1069		
9N013	DAN FUDGE COAL CO	READING 15 OHIO	N&W	84626	0904	902211012		1006		
8N214	FURNACE SUPPLY CO	AVONDALE OHIO	N&W	73760	0903	901211012		1082		
8D005	INDIANA COAL	INDIANAPOLIS IND	N&W	27874	0903	901211012		1284		
5N008	ISLAND OF IND	INDIANAPOLIS IND	N&W	73516	0905	903211022		1105		
7N130	LITTLE CO	LITTLE OHIO	N&W	82369	0904	902211022		1086		
8D032	LEWIS BROS SUPPLY	LOUISVILLE KY	N&W	73612	0903	901205152		1069		
8N138	MATSON HOME SUPPLY	RICHMOND IND	N&W	80583	0904	902148022		1075		
8N139			N&W	83050	0904	902211012		1056		
8N135	NETHERLAND CO	RICHMOND IND	N&W	62659	0905	903001022		1109		
8N233	PITTS COAL SUPPLY	DAYTON 3 OHIO	N&W	84938	0904	902205152		0989		
	AND FUEL CO	INDIANAPOLIS IND			0904	903205152		1024		
	CO	RICHMOND								

A daily report of rail shipments into each sales district is automatically prepared for each sales office from information on punched cards

the week's invoices are run at the rate of 100 lines per minute with an automatic control total at the completion of each district.

After balancing the district total with the controls, the invoice register is printed by a second run through the accounting machine, using the same cards. In the "invoice register run" a summary card is automatically produced representing the total charge to each customer. This, of course, is the ledger card or a debit to accounts receivable. The ledger card may represent one or many cars of coal.

Cash receipts, credits to accounts receivable, are keypunched from the daily remittances and a daily list of cash received is sent to the proper district office. Debit or credit, journal adjusting entries are keypunched monthly.

Monthly Statement

At the end of each month a detailed statement is mechanically made for each customer showing the previous month's balance, detailed charges and credits for the current month and the new balance. The accounts receivable ledger sheet on a heavier stock form is a carbon copy of the customer's statement.

A collection analysis with an aging of accounts receivable is run monthly with a copy for each district office. This report together with the daily list of cash remittances enables the district offices to follow up delinquent accounts.

Various monthly recapitulations of figures are prepared from which book entries are made. Many other analyses are made of sales with a comparison by months or periods with a variety of different breakdowns.

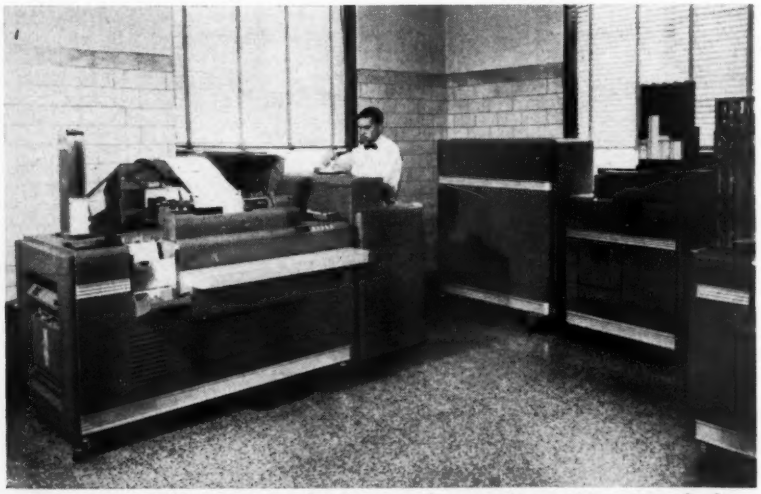
A weekly report is prepared for each district showing the number of orders received for each grade of coal, shipments against those orders, balance to be shipped, quotas for the month and percentage of shipments against quotas. Monthly and year-to-date reports are made containing the same information. Various reports are made on request when a particular analysis is desired concerning production in a certain mine or a particular grade of coal.

A monthly coal inventory report is prepared for each mine showing estimated weight and number of cars of each grade of coal, both in hundredweight and tons. As the cars are scaled and actual weights are received, an adjusted inventory report is run.

A tabulation, by customers, of industrial coal shipments is run showing monthly and year-to-date tonnages and realization.

Mine Payrolls Modernized

As the mechanization of mining operations progressed, the need became increasingly apparent for further mechanizing the company's accounting functions in order to produce more timely cost reports.



Equipment in I.B.M. Department: Left foreground, accounting machine; center background, in front of operator, mark-sensing machine which reads pencil marks; right rear, electronic calculator and punch unit

In 1952 management decided that the mining payroll and cost accounting system should be modernized. A survey was made of several different systems to determine which one would be the most economical and efficient. At the conclusion of the survey it was decided that the speed and flexibility of punched cards would most effectively meet the company's particular needs, so additional equipment was ordered to expand the I. B. M. installation.

There were many problems to resolve before a change-over could be made. The payroll was on a weekly basis and was paid in cash. It consisted of over 4500 employes working at eight different mines. There were a great variety of deductions to be made for each employe, in some cases involving as many as 30 different charges. The employe's time and rate data had to be delivered daily to the I. B. M. Department from each mine, one of which was over 50 miles away. After much discussion and planning a workable procedure was developed.

Experienced I. B. M. personnel spent some time with representatives of the Operating Department and Payroll Office at each mine to fully explain the new system. Many good ideas were derived from these discussions and were incorporated in the new procedure.

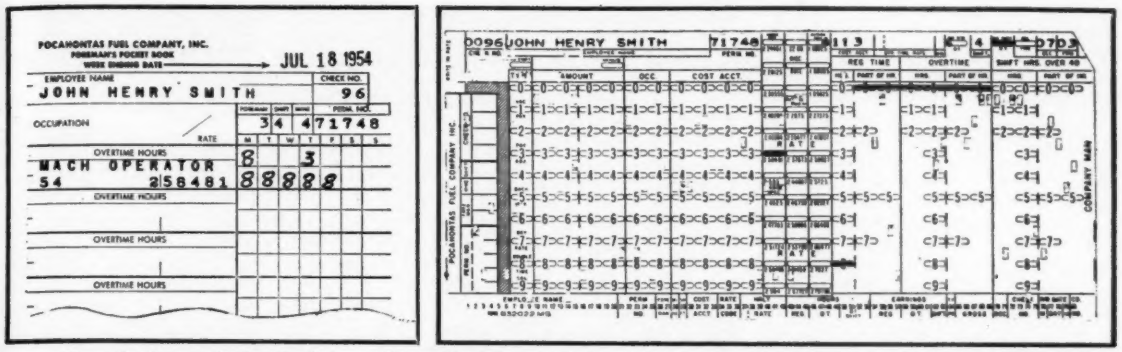
The first step was to put the new system into effect at the mine nearest the I. B. M. Department. Initially, all fixed (repetitive) information had to be recorded in punched card form. This information was keypunched from the payroll records. It was then listed and checked back in detail by the payroll office employes.

Check Old vs. New System

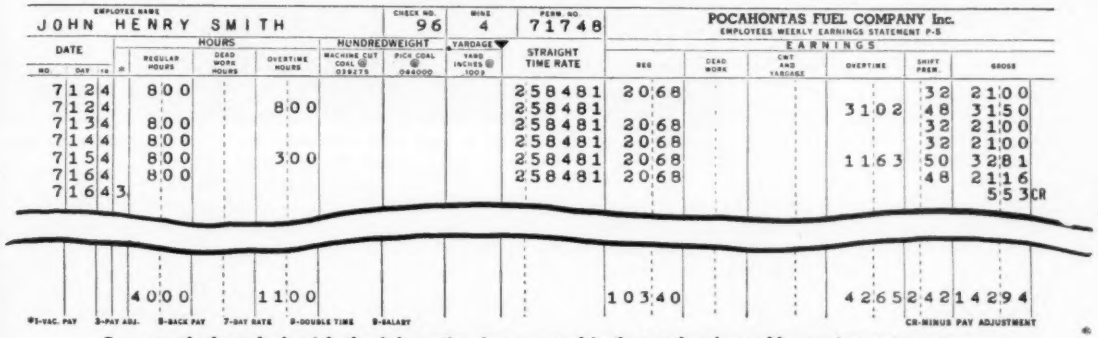
After the preliminary details were completed, payroll work for the first mine was started in October 1953. For a two weeks' period the old system was continued as a parallel operation to the new system. As each mine was taken over the paralleling process was continued for a period of two to three weeks to make certain that nothing had been overlooked. By the end of the year all mines had been changed over to the new method of payroll accounting.

For recording the employe's daily time in the I. B. M. cards the method of sense-marking was adopted. To put it briefly, sense-marking is the hand recording of pencil marks on an I. B. M. card with a soft lead pencil. These pencil marks are "read" electronically by the I. B. M. mark-sensing machines, automatically recording the data into the cards in the form of punched holes. The mark-sensing machine also electronically detects poor or incomplete marks; when these are found a red signal light turns on and the machine stops, allowing the operator to remove the card and manually correct the marking error.

To initiate this record, pre-punched cards are prepared with complete employe identification printed on each card. These pre-punched cards are sent to the timekeeper in the same sequence that the employes' names appear in the time books (previously prepared in the I. B. M. Department) and the sense-marking of hours and rate for each employe can be done rapidly. The sense-marked cards with the previous day's time and rate recorded for each employe are deliv-



From the foreman's time book . . . . the working time of each miner for the previous day is marked on an I.B.M. card


EMPLOYEE NAME
JOHN HENRY SMITH
CHECK NO. 96
MINE 4
PERM. NO. 71748
POCAHONTAS FUEL COMPANY Inc.
EMPLOYEES WEEKLY EARNINGS STATEMENT P-5
DATE
HOURS
REGULAR HOURS
DEAD WORK HOURS
OVERTIME HOURS
HUNDREDWEIGHT
YARDAGE
STRAIGHT TIME RATE
EARNINGS
REG
DEAD WORK
CWT AND YARDAGE
OVERTIME
SHIFT PREM.
GROSS
7 12 4 8 00 258481 20 68 32 21 00
7 12 4 8 00 258481 31 02 48 31 50
7 13 4 8 00 258481 20 68 32 21 00
7 14 4 8 00 258481 20 68 32 21 00
7 15 4 8 00 3 00 258481 20 68 11 63 50 32 81
7 16 4 8 00 258481 20 68 48 21 16
7 16 43 5 53 CR
4 0 0 0 1 1 0 0 10340 42 65 2 42 14 29 4
1-VAC. PAY 3-PAY ADJ. 5-BACK PAY 7-DAY RATE 8-DOUBLE TIME 9-SALARY
CR-MINUS PAY ADJUSTMENT

Sense-marked cards furnish the information incorporated in the employe's weekly earning statement . . . .

ered to the I. B. M. Department each morning. Immediately on receipt, the cards are passed through the mark-sensing machine and the individual employe's time information is automatically punched at the rate of 100 cards per minute.

The sense-marking method has two main advantages over keypunching. First, it is more accurate because the time is recorded from the foremen's time books by the timekeepers at the mines, who are the men nearest the source and better qualified to recognize discrepancies. After almost a year's experience the percentage of timekeeping errors has proved to be remarkably low. Second, by spreading among a number of timekeepers the manual portion of punching the data into the cards, it eliminates a keypunching peak load in the I. B. M. Department just when the time element is most important.

Earnings Figured Automatically

The time cards are then automatically arranged into rate sequence and are passed through the electronic calculator which, at 100 cards per minute, automatically calculates, punches, and checks all extensions of earnings. The cards are then arranged automatically into cost account sequence and run through the ac-

MINE	CHECK NO.	EMPLOYEE NAME	PERM. NO.	MO.	DAY	Yr.
4	96	JOHN HENRY SMITH	71748	7	18	4

POCAHONTAS FUEL COMPANY INC. P-6

TOTAL EARNINGS FOR WEEK → GROSS PAY 142 94
Per Employee's Earnings Statement

DEDUCTIONS

INCOME TAX	F.I.C.A. TAX	CASH ADV.	POWDER	CK. W.M.	ASSESS.	LIGHTS	COAL	HAUL	INSTALL.	STORE
11 69	2 86	10 00				6 19	6 05	1 80	7 50	15 69

ATTACH	DOCTOR	U. DUES	INIT. FEE	HOUSE NOTE	RENT	INS.	HOSP.	CHURCH
	3 00	4 00			6 50	4 30	4 00	1 00

BAL. DUE CO.	WATER	BATH H.	M.B.A.
	50	1 00	80

MISCELLANEOUS ITEM DESCRIPTION

	OTHER CHGS.	OTHER CRS.
U S SAVING BOND	3 75	
PEOPLES LOAN CO	5 00	

PAY STATEMENT
SAVE THIS ENVELOPE
IT IS A STATEMENT OF YOUR EARNINGS AND PAYROLL DEDUCTIONS

I ACKNOWLEDGE PAYMENT OF ALL WAGES DUE FOR REGULAR WORK AND FOR OVERTIME IF ANY TO AND INCLUDING DATE OF STATEMENT.

EMPLOYEE SIGNATURE _____

TOTAL DEDUCTIONS 95 63

	DUE CO.	DUE YOU
NET AMOUNT		47 31

. . . . and his pay statement

counting machine, creating a summary card for each cost account classification. The day's cost summary cards are then automatically collated with the previous day's to-date summary cards. This group of cards is then put through the accounting machine to run a detailed cost report containing, for each cost classification, cost amount today and to-date, cost per ton today and to-date and tons per man today and to-date for certain selected classifications. This report is available to each mine superintendent by the afternoon of the day following the day in which the labor was performed. A consolidated cost report for all mines is also prepared weekly and monthly.

The fully processed earnings cards are accumulated in a file until the end of a payroll week at which time they are automatically matched with master name cards and previous week's year-to-date summary cards. Detailed employe earnings statements are then prepared on the accounting machine, automatically punching a new year-to-date summary card as the total amounts are printed at the bottom of each individual earnings statement.

The new year-to-date summary cards for each employe are then put through the electronic calculating machine which calculates the amount of income tax and F. I. C. A. tax, adds the two taxes together, subtracts the total from the gross earnings to arrive at a first net and calculates state unemployment and Social Security taxable wages. These computations are all made and the results punched into the cards at the rate of 100 cards per minute.

Store Charges

A register of all employes for each mine, previously furnished by the I. B. M. Department, is completed weekly by each payroll office showing for each individual company store charges and miscellaneous payroll charges, such as lights, coal, handling, cash advances, etc., which vary in amount from week to week. These charges are then keypunched. After balancing, the variable charge cards are combined with the fixed payroll charge cards, such as rent, union dues, insurance, doctor, etc. The deduction cards are then collated with the name cards and the current week's gross earnings summary cards, which were created when the employe's earnings statement was written. This group of cards is then used to prepare the employe's pay statement, showing gross earnings, listing all deductions, and the net pay at the bottom of each statement, automatically producing a net earnings summary card for each employe. The employe's pay envelope is a carbon copy of the pay statement.

Cost figures are available to each mine superintendent by the afternoon of the day following that in which the labor was performed

Since the mine workers are paid in cash weekly, a coin and currency denomination report is needed by the bank for filling the pay envelopes. This is done by running the net earning's summary cards through the electronic calculating machine, which computes the number of each denomination of coin and currency. At the end of each week the report is listed by the accounting machine and sent to the bank along with the payroll envelopes.

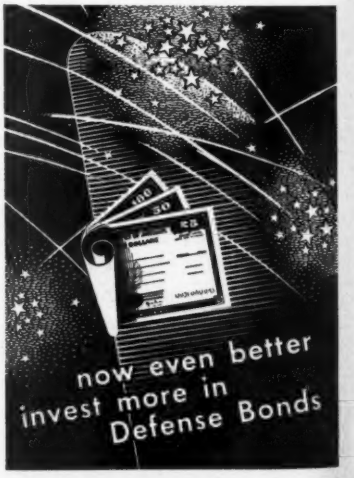
A monthly labor distribution report is run for each mine on the accounting machine. Many other reports are run as final or supplemental reports for State and Federal mine statistical reporting. All quarterly unemployment and Social Security reports as well as annual statements of earnings are prepared on the I. B. M. machines.

Final Results Encouraging

A survey of the final results shows a reduction of about 50 per cent in clerical man-hours with corresponding savings in clerical costs; but of more importance is the immediate availability to management of complete and accurate cost reports. A report listing all employes under each cost account classification has proved to be very valuable in detecting undesirable shifting or expansion of labor forces. Also of value to management and to the labor union is a seniority roster which is used as an impartial and accurate guide in rehiring former employes. Employe reaction to the change has been very favorable. Each man now receives a duplicate of the company's record of his individual earnings and deductions. This has eliminated many questions which formerly arose due to the lack of detail under the old system, and has resulted in a greatly improved employer-employe relationship.

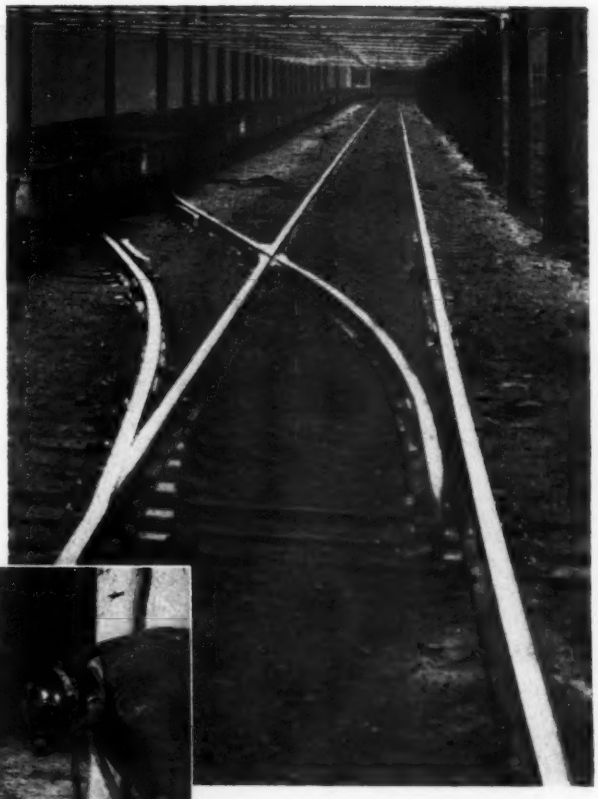
As a result of the company's favorable experience to date with mechanized accounting, plans are currently under way for mechanizing other phases of accounting, including inventory control of maintenance and operating supplies consisting of over 25,000 different items.

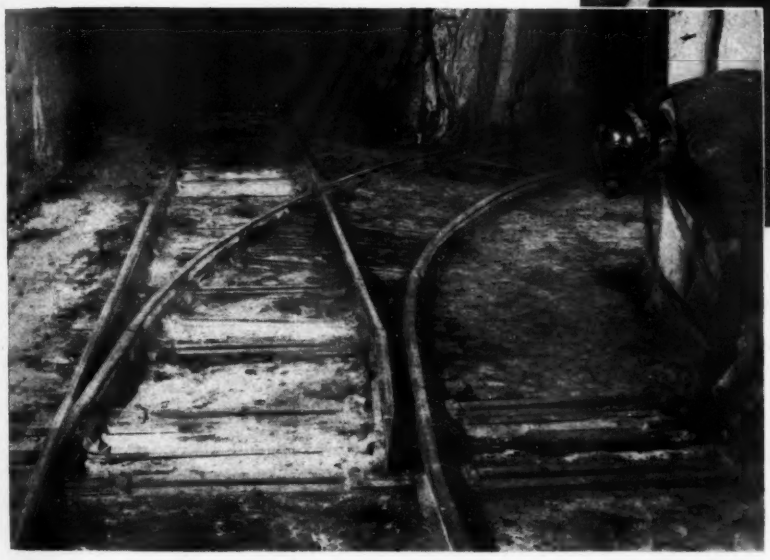
Astonishing developments are currently being made in electronic equipment. These have greatly expanded the usefulness of business machinery and its applicability to business accounting problems. The management of Pocahontas Fuel intends to utilize these developments to as great an extent as may be practicable, in order to maintain its paper work on as modern a basis as is its underground mining and coal preparation.



Above ground or below...

BETHLEHEM HEAVY TRACK FOR LOWER MINING COSTS





More and more mines are realizing the economies of heavier, larger-capacity rolling stock. They're also finding that haulage systems must keep pace with equipment modernization. Outmoded trackwork must give way to heavier track that will support the bigger loads, track that will stay smooth and true for many years to come.

That's where a modern Bethlehem prefabricated layout can help. Bethlehem offers track layouts using rail heavier than 60 lb to American Mining Congress standards. These new designs include switches, frogs, closure rails, guard rails . . . even the tie-plates and frog-plates on which the track is laid.

It goes without saying that every Bethlehem track system includes the planning help of a Bethlehem engineer who is well equipped to look over your workings, appraise your layout problems, and design a complete layout to meet your requirements.

To assure utmost efficiency, your new Bethlehem trackwork will be completely prefabricated. All rails and other track components will be carefully pre-assembled at our plant to assure exact fit when installed at your mine. Every last bolt and splice bar will be included so that installation will proceed like clockwork.

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Headframe at Bodas Iron Mine in Sweden is 170 ft high; hoisting gear is on top floor

Friction Type (Koepe) Hoists

Used Almost Exclusively in Europe This Type of Hoist Merits Consideration by U. S. Mining Men

By GUY N. BJORGE
Vice-President
Homestake Mining Co.

THIS subject is of especial interest because of the extremely wide difference in practice in Europe and the rest of the world. For information regarding the use of this type of hoist in Continental Europe, I shall draw on the two-part account of E. S. Little and C. M. Barrett of the Ontario Department of Mines published in the *Canadian Mining Journal* in January and March of this year.

The first hoist of the friction-drive type was designed and installed by Carl Friedrich Koepe at the Hannover Mine in Germany in 1877. This type of hoist has been generally called the "Koepe" hoist in Central Europe and that name has spread rather widely.

During this century the use of this type of hoist has grown steadily in Europe until now it is used almost exclusively. In West Germany, 90 percent of 559 surface installations are friction hoists. Nearly all of 1700 internal shafts in the Ruhr are so equipped. In the other countries of Western Europe, the percentage of friction hoists may be even higher. There have been very few, if any, installations of drum hoists in recent years, and many older drum hoists have been converted to the friction type. In Britain, there were only a few installations prior to 1953 when 12 were placed on order.

A review of recent hoists installed in Sweden will be of interest. A letter from Dr. E. G. Malmlow, Aros Electric, Inc., states:

> "In Sweden nearly every mine has A.S.E.A. (Allmanna Svenska Electriska Aktiebolaget) friction drive hoists and certainly no drum hoists at all have been purchased during the last 15 years."

The use of this type of hoists is only now spreading to the United States and to some other countries. A list of all friction type hoists delivered or under manufacture by A.S.E.A. since 1938 discloses that the first 37 hoists listed, most of which were delivered prior to the end of 1953, were all for mines in Sweden. Of 19 hoists under manufacture for delivery from 1954 to 1956, 11 were for export to other countries, including four to Finland, three to the United States, three to Canada and one to South Africa.

The range in specifications for the 56 hoists discussed above follows:

	Minimum	*Maximum*
Pulley diameter	37 in.	23 ft
Number of ropes	1	4
Diameter of ropes	5/8 in.	2¾ in.
Winding distance	460 ft	5500 ft
Hoisting speed	600 fpm	3200 fpm
Weight of load	1900 lb	42,000 lb
Motor horsepower	28	3800
Motor RPM	65	1200
Number of levels	2	15
Manner of operation	46 of the 56 hoists have push button operation from two or more levels.	

Friction-Drive Principle

In this type of hoist a driving pulley replaces the drum which has so long been conventional in this country, and the rope is taken around the driving pulley but once so that the arc of contact between rope and pulley covers only a part of the circumference of the pulley. The arc of contact is usually from 180° to 200°. In modern design two or more ropes are used in parallel in order to assure safety in

operation. The same ropes join the two skips or cages, in balanced operation, or they join a skip or cage on one side with a counterweight on the other. A balancing tail rope joins the bottoms of the two skips or cages or the skip or cage and the counterweight. The tail rope should be of the same weight per unit length as the hoist ropes. The counterweight balances the weight of the skip or cage plus one half the load. The ratio between the loads on the ropes on each side of the driving pulley must not exceed a certain figure, the pulley constant, which is determined by the arc of contact and the coefficient of friction.

The driving pulley has a groove for each rope with a lining of friction material which is usually leather or aluminum. With proper design, the lining has a life of several years. Ropes are either used dry or covered with a suitable varnish. The use of galvanized ropes is increasing.

Tail ropes carry their own weight only and their service life greatly exceeds that of the hoist ropes. Even with multiple hoist ropes, the tail rope may be a single rope and no guides or sheaves are needed at the bottom of the shaft where the tail rope turns.

An advantage claimed for the friction drive principle is that several parallel ropes can be used instead of a single rope. There may be two, three, four or even more smaller ropes because they are taken around the driving pulley only once. The load is then divided between the several ropes. Simple balance arms are sufficient for the equalization of the loads on the parallel ropes. The several parallel ropes provide increased safety, for if one rope should fail, the remaining ropes will safely bring the hoist to a stop.

Size of Hoisting Equipment

The multiple rope principle permits the use of smaller hoisting ropes. Thus, if there are four parallel ropes instead of only one, the diameter of these ropes can be only half as large. Then the diameter of the driving pulley can also be half as large. With only four ropes on the pulley, the length of rope on the pulley is the same regardless of the depth of the shaft and the reduction in weight and inertia is very important.

With a smaller pulley, its speed for a given hoisting speed is increased as is the torque. The driving motor can therefore be of higher speed if directly connected or the gear reduction ratio can be decreased. These changes result in reduced physical dimensions, weight and inertia.

The substantial decrease in weight and volume of hoisting equipment makes it practicable in many cases to install the hoist in the headframe directly over the shaft. The reduction in inertia of rotating parts results in lower peak power demands. The decrease in size, weight and inertia will obviously result in lower cost for the hoisting equipment which is today a most important consideration.

Multiple Level Operations

The greatest advantages of the friction type hoist result when hoisting is to be done from a single level at considerable depth. The development of the multiple level principle and the use of counterweights has given it advantages also in the case of shallow shafts and when hoisting from a number of levels. In Europe, it has in fact made the cylindrical drum hoist obsolete.

Summary of Features

The features of friction-drive hoists which have led to their almost exclusive use in Europe are as follows:

During a European tour last year, the author spent the month of August in the three Scandinavian countries. While there, he made brief visits to five mines and saw several installations of Friction Type or Koepe Hoists. One was a drum hoist converted to friction type. As a result, he was asked to prepare this article. The mine operators and the manufacturers there very kindly furnished ample data for this short review and summary of this interesting topic.

A—Increased safety in operation due to:
- (1) the use of several parallel ropes instead of one single rope. If for some unexpected reason one rope should break, the others will be of sufficient strength to bring the hoist to a safe stop
- (2) the use of safety wedges on the shaft guides in order to assure rope slip in case of over-winding the hoist

B—Less rope wear due to:
- (1) the fact that there is no fleet angle
- (2) the protection of the ropes from the weather when the hoist is mounted in the headframe
- (3) the very slight, or the total absence of, S-bends in the ropes with the hoist in the headframe
- (4) the elimination of cross-overs in multi-layer winding practice

C—Lower peak power demand due to:
- (1) the balancing tail rope
- (2) the lower inertia of all rotating parts

Lower power consumption due to:
- (1) lower acceleration peaks
- (2) the elimination of flywheel and regulation losses

D—Less weight and volume; mounting of hoist in headframe possible due to:
- (1) the shorter pulley face
- (2) the smaller diameter of pulley for multiple-rope hoists
- (3) the increased speed of the motor for direct drives
- (4) the decreased ratio through the gears for geared drives
- (5) the decreased motor rating because of less inertia in rotating parts

E—Adaptability to hoisting from several levels

F—Increased capacity of hoists

G—Hoisting reserve in emergencies due to independent operation of single hoists with counterweights.

A disadvantage in some cases is the fact that the rope cannot be lubricated because of the need for friction. This is particularly true in mines which have acid water. For example, at the Orkla Pyrite mine at Lokken, Norway, conventional drum hoists are used because the shafts are wet and the mine water contains much acid. At night and on Sundays when there is no hoisting, the skips are left in the headframe at the surface in order to keep the ropes out of the mine water. This disadvantage has not, however, been a hindrance to almost complete adoption of this type of hoist in Europe.

Two of the friction drive hoist installations in Sweden which I had the opportunity of inspecting last year will be briefly described.

Hoist at the Bodas Mine

The Bodas Iron Mine with an annual production capacity of 135,000 tons, owned by Sandviken Steel Works, is located in central Sweden. The mine is now 800 ft deep but the hoists have a maximum winding distance of 1900 ft.

The headframe is a square structure made entirely of reinforced concrete 170 ft high. A concrete structure integral with the headframe houses a crushing and dressing plant, flotation plant, compressor, shops, supplies and office.

Two friction drive hoists are installed on the top floor of the headframe directly over the shafts. They are two-rope hoists installed in 1947 and were among the first push button operated multi-rope hoists installed in Sweden. The shaft has a cage compartment at one end and skip compartment at the other with two smaller

compartments between, one of which has the counterweights for both hoists. The hoists are set at an angle of approximately 17° with the long dimension of the shaft and dimensions are such that the ropes pass vertically from the driving pulleys to the skip and cage and their respective counterweights.

The data for the hoists are:

	Skip Hoist	*Cage Hoist*
Useful load	4.4 tons	0.95 tons
Maximum length of wind	1900 ft	1900 ft
Weight of skip or cage	7.7 tons	2.0 tons
Counterweight	10 tons	2.65 tons
Ropes—number	2	2
Ropes—diameter	1¼ in.	¾ in.
Pulley diameter	9.5 ft	5.5 ft
Present speed	660 fpm	1000 fpm
Future speed	1000 fpm	
Present hoist motor output	136 hp	52 hp
Power	Direct Current	Direct Current
Operation	Push Button	Push Button
Present number of levels	2	9

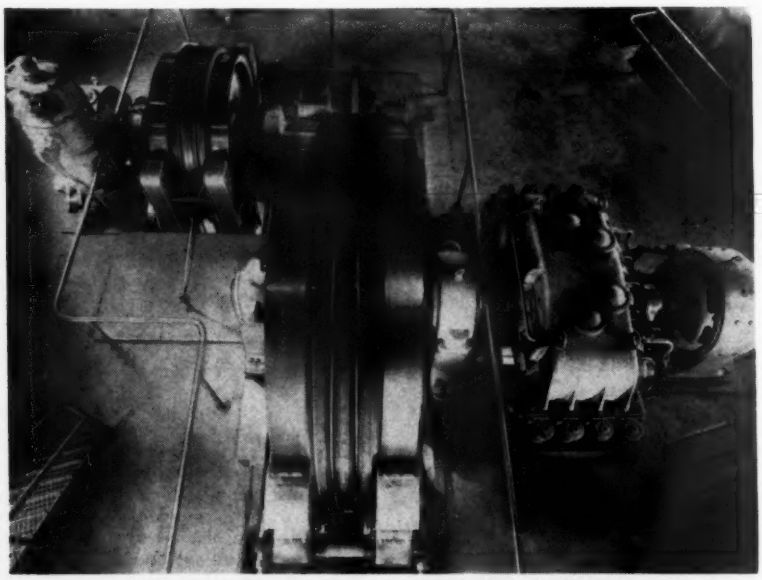
The skip is operated by a push button near the measuring pocket when it has been loaded. It automatically accelerates to full speed, travels up the shaft, slows down to creeping speed just before its dump rollers enter the scrolls at the dumping station and stops in the dumping position. After a few seconds the hoist automatically reverses and starts downward, going at creeping speed until the bottom of the skip has been safely closed, then accelerates to full speed and returns to the loading station. The cage is controlled by the miners themselves without the help of a cage tender.

The driving pulleys are all welded construction of plate and rolled steel sections provided with an insert of friction material in which a groove is cut for each rope. The friction rings of laminated leather are secured to the pulley by means of blocks screwed fast to the pulley with flat topped bolts.

Installation at Grangesberg

The iron mine of Trafik A/B Grangesberg-Oxelosund at Grangesberg is in many ways a contrast with the Bodas Mine. This mine is located at the very south of Dalecarlia and about 125 miles northwest of Stockholm. This ore area had been known for a long time. It was already being worked in the Sixteenth Century and in the middle of the Eighteenth Century about a hundred small mines had been opened. In 1896 the present company was founded and most of the mines and also the ore railway were gathered into one operation and large scale production followed. Now mine production is about 2,600,000 tons annually from which 1,600,000 tons of clean ore and concentrates are shipped.

The Central Shaft which is the ore hoisting shaft has two ore hoists and one passenger hoist. The headframe is a concrete structure about 160 ft high. It has four skip compartments with 14-ton skips.



Friction hoist installations at top of headframe, Bodas Mine

In 1941 a single rope friction type hoist was installed at this shaft. The data on this hoist follow:

Type of hoist	2 skips
Diameter of driving pulley	23 ft
Number of ropes	1
Diameter of rope	2¾ in.
Maximum winding distance	3300 ft
Hoisting speed	3200 fpm
Load	32,000 lb
Motor horsepower	3800 hp
Manner of operation	Manual

The cage hoist at Bodas and the ore hoist at Grangesberg present about the greatest contrast of all of the friction type hoists now in operation in Sweden.

The Swedish Electric Co. (A. S.-E. A.) lists 21 hoists for delivery from 1953-1956 for Kiruna and Malmberget. The data for eight of these hoists for Kiruna follow:

Type of hoist	1 skip
Diameter of pulley	10 ft 8 in.
Number of ropes	4
Diameter of ropes	1⅜ in.
Winding distance, maximum	1500 ft
Hoisting speed, maximum	2200 fpm
Load	44,000 lb
Counterweight	57,000 lb
Motor horsepower	1150
Manner of operation	Push Button
Number of levels	3

At Fosdalens Bergverks, Malm, Norway, two friction type or Koepe hoists are being installed at an inside shaft which is nearly four miles from the portal of the Adit Level. One is a skip hoist for hoisting iron ore in two bottom dump skips operating in balance from an ultimate depth of about 2000 ft. Skip capacity will be 13,000 lb. The cage hoist will operate one double deck cage with a counterweight. The cage will carry 40 men per trip with a hoisting speed of 1200 fpm. An interesting feature of the skip hoist is that it is automatic with starting and stopping controlled by the volume of ore in the bins.

First American Installations

The first major installation of a friction type hoist is now being made at the C-Shaft of the Cleveland Cliffs Iron Co., at Ishpeming, Mich. These are A. S. E. A. Hoists and include one cage and two skip hoists.

In Canada, the Falconbridge Nickel Mines, Ltd., has on order for delivery in 1955 two hoists of this type for its No. 1 Fecunis Shaft.

In both of these cases, company engineers spent some time in inspection of hoist installations in Scandinavia and elsewhere before making the selection of this type of hoist. These hoists are of special interest, not only because they are the first American installations, but also because they are designed for greater

(Continued on page 98)

Convenience is an important aspect of change house location

Modern Change Houses for the Mining Industry

Many Advantages Possible With Close Attention to Design and Maintenance

MINING, in any of its phases, is inherently dirty work. This means that the miner usually wears clothes specifically adapted to the work he is doing. Frequently these clothes are not suitable for use away from the mines. Dust and water introduce their own particular problems as to comfort and cleanliness.

It used to be the custom for miners to wear their dirty clothes home and change there. This custom no longer prevails though, and change houses or bath houses are provided at most mining operations nowadays.

Health is man's greatest asset and should be guarded at all times. Properly designed change rooms not only protect the health and welfare of the employe, but cut down labor-turnover and promote better employe-employer relationships. This has been proven many times. Despite the importance of change houses and the protection they offer against illness, it is pretty well agreed that the planning of industrial change rooms receives the least attention of all items entering into production.

Since change rooms have an important place in industry, their design and layout should be thoroughly investigated before remodeling old installations or planning new ones. This article is not intended to be a thorough study of all the problems that enter into the design of a change room. It does, however, attempt to give some of the basic standards developed for modern change room design, and to point out the items that must be considered and included in laying out any change room. In many states and localities locker room and sanitary facilities are governed by local codes or laws. First step then should be to consult the local code before remodeling or constructing anew.

Pick Right Site

Generally speaking, too little attention is given the location of the change room site. Too often it is selected because of favorable topography, or because it is an unused location on the plant grounds, or because of its convenience to the boiler plant. If located in a building of its own, the change room should be as near the main working area as possible. Men dressed for inside work should never be required to walk long distances in cold or wet weather without outdoor clothing. In the mining industry change houses should be close to the mine entrance. In several cases where the change house has been moved from a remote location to one close to the portal, there has been an appreciable reduction in absenteeism, particularly in the winter.

For ease of maintenance and economy of construction, it is advantageous to have one large central change house with complete shower and toilet facilities. If the mine has several openings or a number of widely scattered buildings, it is good practice to place limited toilet and washing facilities throughout the area so that no one will be required to walk more than 150 ft to a washroom. The man hours

Article prepared by The Moore Co., Charleston, W. Va.

Better employe health means a reduction in absenteeism

thus saved should soon pay for the cost of these auxiliary washrooms.

Construction Details

Concrete floors with a slope of about ¼ in. to the foot toward properly located drains have been found to be best for change rooms. It is customary to roughen the surface of the floor slightly or to sprinkle sand or carborundum over the cement before it sets, to minimize the slipping hazard. Often the concrete is covered with a layer of melted hot asphalt at least one in. thick. Besides being a warm, pleasant surface for the feet, this flooring material is economical, waterproof and easy to replace. Copper oxycloride cement floor surfacing is often employed because it retards the growth of the molds and bacteria responsible for many skin infections. Smooth, light-colored walls, in a restful color scheme will help reduce employe fatigue. The wall should be easy to clean to a height of seven ft (a maintenance man's reach) and the angle between walls and floor should be curved. Preferred materials for wall construction are tile, glazed brick or waterproof cement.

Proper heating to protect the miners' health and afford them comfort is of extreme importance. The area in which employes bathe should be kept between 75 and 80° F the year around. In dressing areas a temperature of 68° F is sufficient. Either unit heaters should be employed to induce heated air into the room from the ceiling, or a steam or hot water system be used, with pipes carefully placed to prevent bodily contact. If pipes are near the floor level, effective screening must be used.

Keep Well-Lighted and Aired

The entire locker room should be adequately ventilated, with 6 to 10 air changes an hour recommended. If mechanical ventilation is employed, warm air should be introduced near the ceiling and exhausted near the floor in order to reduce dust and aid in circulating warm air over clothing suspended for airing.

Natural ventilation system should combine windows, with the sills at least seven ft from the ground, and roof ventilators. The ventilators should be equipped with a manually operated damper and windows should be easily operated from the floor. In this way, hot, humid air with odors from clothing can escape through the roof and drafts below shoulder level will be avoided.

Illumination by daylight requires a window proportion of one sq ft of glass to each 10 sq ft of floor area. Best results in artificial illumination has been obtained by placing the lights on the side of the room, preferably on the long side. The ratio of the height of the lights to the width of the room should not exceed 1 to 3 to obtain the best illumination. If a greater ratio is necessary, overhead light should be used.

Particular attention should be given to the relationship between lockers, toilets, wash fountains, showers and entrances and exits. Equipment should be placed to make it natural for the user to progress through the room, from entrance to exit with a minimum of confusion and unnecessary walking. Correct traffic flow will reduce the space required and allow the employes to obtain maximum use of the facilities.

Clothes Storage

There are three common ways to store employes' clothes and personal effects: hooks or ladders hanging on the wall; in floor lockers; and in overhead basket lockers.

The first of these ways of storage is applicable only to the very small establishment. In plants of any size hooks are impractical because of the inability to control the location of individual clothes, lack of security to the individual, and because they do not provide for storage of personal effects.

Experience has shown the steel locker to be satisfactory if it is mounted on a terrazzo or cement island, and built with a steeply sloping top to prevent its use for shelf purposes. Special care must be taken to make sure the lockers are thoroughly cleaned inside every two weeks to prevent accumulation of dirt and trash. A minimum of four ft should be allowed for aisle space between each row of lockers with integral benches and this must be increased to six ft if a separate bench is placed between the rows of lockers. It is highly recommended that a system of forced locker ventilation be installed to exhaust air from each individual locker. Otherwise unsanitary and unhealthy conditions will develop in the lockers, accompanied in all probability by objectionable odors.

Overhead storage has proven to be a satisfactory method of handling clothes. The use of overhead storage baskets enables the floor area needed for the locker room to be cut down, more efficiently used, and more easily cleaned. Low material cost makes installation of baskets inexpensive. Equally important is the fact that the basket storage idea allows clothes to aerate much better than other types of storage. Pilfering is cut down because thieves have no place to work unobserved and cannot reach personal effects. Offensive odors are removed, bacteria spread is checked and clothes are quickly dried because they are hanging loose in light as well as in air. Also, with overhead baskets, the maintenance of the change room can become chiefly a matter of hosing down floors and washing walls.

Overhead storage has proven to be a most satisfactory method of handling clothes

A sufficient number of benches should be provided to accommodate 30 to 50 percent of the personnel using the change room at any one time. Benches should be attached firmly to the floor to prevent shifting. Preferably, they should be made of smoothly finished wood, about 17 in. from the floor and 8 to 12 in. wide. When used in a room containing clothing baskets, the benches should be placed along the rail on which the chains holding the baskets are locked. When the baskets are lowered they are then no more than six to eight ft away from the benches.

Needed Facilities

Generally speaking, the toilet rooms should be separated from the change room by a solid wall. Toilet fixtures should be provided in the ratio of one for 10 persons, two for 25 persons, three for 50 persons, four for 80 and five for 125 persons of each sex. For each additional 30 persons, or fraction thereof, one more fixture should be provided. Where urinals are provided, it is permissible to reduce the number of fixtures by the number of urinals, except that the number of toilet fixtures cannot be reduced to less than ⅔ of the total number of urinals and toilet fixtures required.

Wash fountains are gradually becoming the most widely used industrial wash fixture, although lavatories and wash troughs are still used in many places. The wash fountain provides the most washing facilities in the smallest space, cuts water waste and caves on pipe connections.

Lavatories should be provided at the rate of one basin or 20-in. wash trough for every 10 employes. Wash fountains should be 54-in. circular for 50 users, 36-in. circular for 30 users, 54-in. semi-circular for 30 users or 36-in. semi-circular for each 15 users.

Use Stall Showers

Showers should be supplied in a ratio of one shower head for each 10 men on a shift. This ratio is many times determined by local code, however, and the code should be consulted before reaching a decision. Most modern washrooms have shower stalls with one shower to each stall. Group showers offer no protection from splashing water from one shower to the other; it is difficult to control drafts in an open room system, and the likelihood of horse-play is increased. Temperature of the water must be regulated by a safety mixing valve to prevent the worker from inadvertently turning on extremely hot water that might cause severe burns.

Wash fountains are gradually becoming the most widely used industrial wash fixture. This is a corner of the change room of the Mayflower mine, New Park Mining Co. in Utah

In their sanitary and labor codes some states now require the employer to furnish soap for the workers, and this practice is rapidly growing. Either powdered or liquid soap is usually furnished, depending on the conditions encountered at the individual plant. One of the many soap manufacturers will usually make an analysis of particular requirements and make recommendations. Workers seem to be about evenly divided in their preference for powdered or liquid soaps. At many mines the practice is to furnish both types, allowing the individual to make his own choice.

A sufficient supply of clean, chilled, safe drinking water, preferably with temperature not above 48° F, should be made available in clothes storage and washrooms, but they should never be included in toilet rooms. It is recommended that one drinking fountain be supplied for about every 50 persons. Drinking fountains should also be provided with a stream of water of 65 to 70° slant to eliminate the possibility of drawing falling water back into the ascending column, and yet not produce the hoselike force of a stream at a greater slant.

General Considerations

Entrances should be screened, to insure privacy, and doors should be self-closing. At least two exits should be provided. Adequate fire-fighting equipment should be available at all wash or change houses. Safety and announcement bulletin boards may be placed in a prominent place, where they are passed by all employes several times a day.

Athlete's foot presents a serious problem in all change rooms. The most common and successful method of control is to place a shallow container, mat or mechanical dispenser in the doorway between the shower and change room so it cannot be avoided or forgotten. A wide divergence of opinion exists as to the proper methods and chemicals. To best control this infection it is recommended that competent medical authorities be consulted before a final decision is reached on the particular method to use.

The change room should be cleaned thoroughly after each shift. Floor and lavatories should be cleaned with a hose, and wash fountains with a high-grade neutral soap. If the change room is of any size, it is recommended that a caretaker, trained in first-aid, be assigned to work in the change room on each shift. Enough receptacles for waste should be placed around the change room to encourage maintaining neat, orderly premises at all times. If the entrance is from the outside, it is recommended that a trench, covered by open steel grating, be placed in front of the entrance. This will prevent tracking dirt and gravel inside.

A well-planned change room will leave sufficient area for a later increase in facilities without expensive structural changes.

A clean worker is a healthy happy one, and a happy worker is a good, steady efficient one. The intelligent placing, design and furnishing of industrial change rooms is perhaps one of the most direct and certain methods of increasing workers' morale. Don't neglect it.

Attention is now being directed toward economies in roof bolting

Roof Drilling Supervision and Maintenance

A Preliminary Report of the Committee on Roof Action, Presenting Accounts of Maintenance and Inspection Practices at a Number of Bituminous Coal Mines

By W. D. HAWLEY and V. O. MURRAY

NO development in the history of modern coal mining has been as spectacular and far-reaching as roof bolting. Since the first experimental installations just a few years ago, it has rapidly proved itself to be a practicable method of mine roof support and there are few coal fields where roof bolting is not now accepted. Its first success in converting "bad top" to "good top," soon brought the further advantages of wider working places, fewer interruptions from slate falls; and in general, improved mining efficiency and higher tonnage. This naturally led to lower operating cost and during the earlier stages of roof bolting, the immediate and obvious cost savings were considered to be self-sufficient.

For quite a while little attention was given to possible further savings that might result from economies all along the line, and particularly through the reduction of repair cost for drills and bits. Now, however, a number of companies are setting up roof bolting maintenance and inspection departments. Then, too, it has become known that stresses in mine roofs may change as time goes on, and as mining advances the bolt installation may need some adjustment. Consequently, some system of inspection is indicated. The Committee on Roof Action has started a study directed toward finding economies in drilling and in drill and bit maintenance. These studies will cover a wide range, including speeds and thrusts for drilling in various types of mine strata and also torques for the bolt installation.

In undertaking this study, the Committee is following the usual plan of the Coal Division—first to secure data on actual operations and then to see where these data lead. In accordance with this procedure, the Committee has gathered accounts covering maintenance and inspection practices at a number of bituminous mines that have been successful in their roof bolting applications. These accounts are given below as a progress report and a subsequent report is now in preparation.

Inspection and Maintenance

Mine A

Section foremen supervise the roof bolt crews constantly, and the mine foremen and superintendent check the bolting practices intermittently. The roof drill is checked every shift by repairmen.

Mine B

The company inspector makes regular inspection of roof bolting methods every two weeks. In addition to observing actual techniques of installation, he also makes random checks of torque on both newly installed and older bolt assemblies. This report is turned over to both the mine foreman and the general manager for any follow-up necessary.

Having had considerable trouble with widely differing torque valves on bolting sections over the mine, an extra torque wrench is now kept at each portal. The section foreman can take this to his section and illustrate to the crew the effort necessary to install the roof bolts to meet minimum torque requirements.

All maintenance of roof drilling

equipment falls to the master mechanic and his crew. Except in cases of emergency, repairs are not made on the section. Only stoper repairs are handled in the company shop; impact wrenches are serviced, for the most part, by the supplier. Management feels that stoper repair costs have been too high and are currently working up costs for everyone's benefit. One principal source of trouble recently has been excessive wear on drill chucks causing increased breakage and higher chuck replacement costs. The manufacturer has a couple of worn chucks at his factory for hardness and wear tests.

Mine C

Maintenance has been a difficult problem in the past at this mine. However, the recent use of small compressors mounted on rubber at the face allowing the stoper drills to be connected to the compressor at all times eliminated an early trouble of dirt in the hammers caused by moving pipeline and hose. The next big problem is the proper oil in the compressor and the stoper drill. Maintenance has improved tremendously since a letter of instruction from the management was sent to both foremen and drillers telling the importance of using only drill oil in the hammers and compressor oil in the compressors, and outlining what happens when hydraulic oil is used in either of these pieces of equipment. Choosing men who are conscientious and take interest in the work for the bolting crews is the best solution found so far to the problem of preventive maintenance. An electrician or repairman on each section carries spare parts for both the compressor and the drills and is responsible for their maintenance.

Two recently acquired line oilers shut off the air from the hammers when the oil reaches a low level in the oiler reservoir. These are installed on drifter hammers and apparently the problem of not enough oil has been whipped. However, this will not guarantee the correct oil. After a trial, this type of line oiler may be installed on all roof bolting equipment at the mine, as it definitely eliminates running drills dry.

Mine D

The section foremen on each shift are furnished bolting and timbering plans which are in turn passed on to the bolting crews under their supervision. Visual checks are made by foremen as each place is bolted. Periodic inspections are made by the engineers using a torque wrench to determine if sufficient torque is being applied in the stallation of the bolts. Results of these tests are given to the bolting crews and their supervisor at the time they are made, and a record of the torque readings is passed on to the superintendent. State and Federal bolt inspectors are also utilized.

Each working section has available a repair man who is responsible for the "on section" maintenance of drilling and bolting equipment, and the performing of minor repairs to this equipment. If major repairs are needed, the equipment is traded out to the repair shop for a like item of equipment which is kept available near the working faces, generally at the dispatcher's office. When equipment reaches the repair shop it is given a complete overhaul and returned to the dispatcher.

Drill Thrust and Speed

One company has done extensive experimentation with an especially made drill. It is a rotating air-powered drill mounted on a stoper leg and has proved to be the most satisfactory drill tried to date. Throttles on both leg feed and drill allow regulation of the thrust and speed so that the combination on various types of strata can readily be observed.

Roof bolting operations require close supervision

The drill is rated 310 rpm, 170 ft lb of torque at 90 psi. The stoper leg is 2½-in. I.D. and would provide 440 lb of thrust at 90 psi. A lever throttle allows regulation of speed from 0 to 310 rpm, and a roll-type throttle allows thrust on the leg from 0 to 440 lb. Air consumption is estimated at 70-80 cfm.

No accurate measurements of speed or thrust have been made, but instead the operators have been trained to get the "feel" of the drill. Once he gets the "feel" he can regulate his drill to handle most any type strata. In most cases varying strata are encountered in each hole drilled. For instance, in one mine the roof is composed of soft laminated sandstone with some hard streaks and thin seams of coal. In drilling a hole, the operator can start his hole using full thrust and speed and a straight steel. At a depth of about three ft very soft sandstone and coal is encountered and the operator must slow down his speed, and also cut down on the thrust. An auger type steel must be used to clean the hole. It must be lowered a few inches every few seconds to aid in cleaning. At about 4½ ft depth the strata become harder, and drilling at full speed and thrust can be resumed.

In another seam, numerous sulphur lenses are encountered in the first three ft of the immediate roof. These are extremely hard, and at 440 lb of thrust, progress is almost negligible. To increase drilling rate a lever was used to increase thrust. It is estimated that an additional 200 lb was required to penetrate the sulphur lenses rapidly. In this type of rock a leg with a larger bore diameter would be required, or the drill might be mounted on two legs instead of one.

In general this mine would estimate the following thrusts and speeds for different types of strata as being the most satisfactory:

Strata	*Thrust*	*RPM*
Sandstone (medium)	400	310
Sandstone (soft)	300	310
Coal	200	310
Shale (soft)	300	310
Shale (hard)	400	310
Clay	10-15	150
Sulphur lenses	600	310

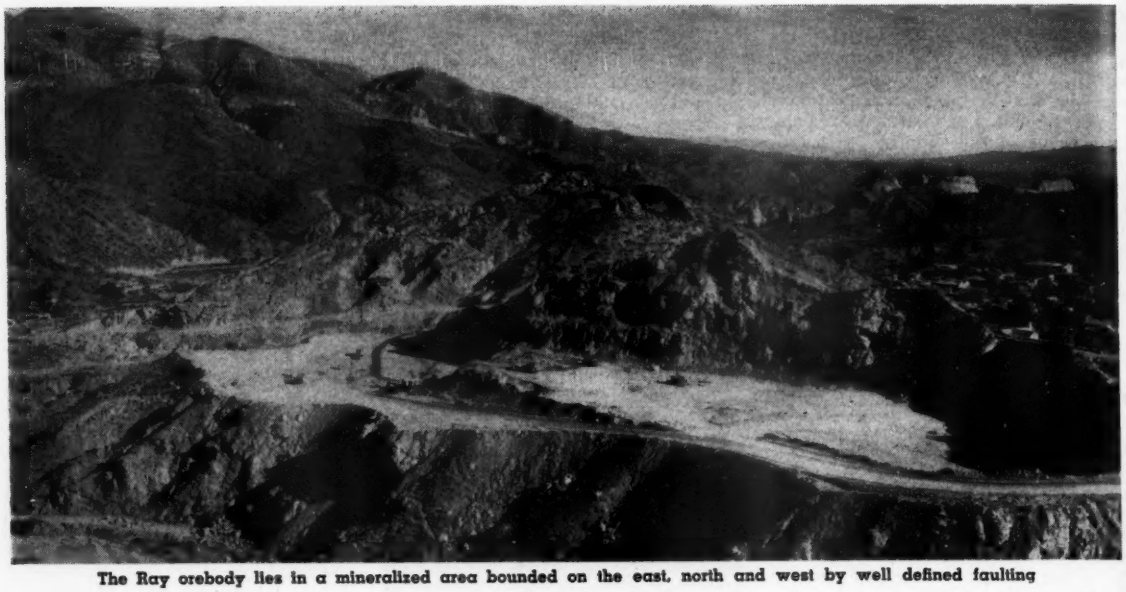
Instructions to Drill Operators

Mine E

In instructing drill operators, the "feel" of the drill is stressed. A potential operator is instructed by a regular operator, who describes the drill, controls and principles of operation. The instructor then drills a series of holes, stressing the importance of always knowing the depth of the hole and what will be encountered at different depths so that thrust and speed can be regulated. When the potential operator has watched the instructor drill several holes he takes over and is instructed and criticized by the instructor until he is well versed in the operation. After a few days the new operator gets the feel and can handle the drill like a veteran.

Bit Sharpening

One thing is evident from all reports. The importance of sharp bits cannot be stressed too highly. Bits must be inspected regularly and changed as soon as dullness is noted. Drilling can be done with dull bits, but the speed of drilling is increased greatly with sharp bits. The operator drilling with dull bits is lazy or poorly instructed or mine management is lax in furnishing necessary materials.



The Ray orebody lies in a mineralized area bounded on the east, north and west by well defined faulting

Open Pit Operations In Old Caved Areas

Ore Recovery Exceeds Expectations Despite Minor Disadvantages

By J. C. VAN DE WATER
General Superintendent of Mines
Ray Mines Division
Kennecott Copper Corp.

RAY is located in Pinal County in south-central Arizona in what is known as the Mineral Creek mining district. The Miami-Inspiration District lies about 20 miles to the northeast; Magma about 15 miles to the northwest; San Manuel about 40 miles to the south; and the three Phelps Dodge properties of Ajo, Bisbee and Morenci not too distant to the southwest, south and east.

The Ray ore body lies in a mineralized area bounded on the east, north and west by well defined faulting, and consists of schist with intrusions of quartz porphyry and diabase. It extends roughly 7000 ft east and west by 2000 ft north and south, and varies in depth of ore from a few feet to as much as 500 ft. The predominant ore mineral in the schist and quartz porphyry is chalcocite with some native copper. It has been heavily oxidized in most areas. In the diabase the ore mineral is chalcopyrite. Except for the diabase, ore deposition is very erratic, going from one percent or over to nil in a few feet, in most cases, with no apparent structural explanation.

First attempt to mine the deposit was made by an English company just prior to 1900. This early venture failed because the anticipated high grade ore failed to materialize in sufficient quantity.

The productive history of the area began in 1911 with the erection of a mill at Hayden and the start of large scale mining operations. Several companies operated in the area for some years, and in May 1907 many of these were brought together to form the Ray Consolidated Copper Co. In 1911 and 1912, the Gila Copper Co. and the Ray Central Copper Mining Co. were acquired, and in 1926 the Ray Hercules property. The Ray Consolidated Copper Co. was taken over by the Nevada Consolidated Copper Co. in 1926 and later became a part of Kennecott Copper Corp. in 1933.

Mine High Grade Underground

Underground mining was concentrated principally in the higher grade areas found in the east and west ends of the deposit. The eastern end was smaller in total tonnage and very irregular, but was higher grade, while the west end was larger and more uniform though slightly lower in grade of ore. Mining was started in both areas around 1911 with the east end closing down in 1929 and the west end still in production but expected to close down about the end of the present year.

Some years ago the end of underground mining was foreseen and a thorough study was made of the lower grade central area. This study showed a sizeable tonnage of ore that could be mined by open pit methods. This area was planned as a starting point for pit operations. Later extensions would take in all of the previously mined eastern area and the fringes of ore around the mined area in the west with the possibility of, some day, being able to mine the entire western end.

Initial stripping of this central area plus the construction of a large diversion channel to free the area of flood waters was undertaken by the Isbell Construction Co. in 1948. The contractor completed this work in 1951 and Kennecott took over. The central pit is well along now and as the stripping ratio drops to a lesser figure,

some of the equipment will be diverted to new stripping in one of the fringe areas that is now being prepared.

Pit in Central Area

As stated above, the present pit lies in the central area between the eastern and western underground workings, but overlaps the eastern workings to the east and south so about one-third of the pit tonnages have been from these old caved areas. This has brought up a number of conditions a little out of the ordinary, some good and some bad. Probably the first and most obvious unfavorable condition is putting men and heavy equipment over old underground openings. Actually this has given very little trouble, as most of the underground areas in the present pit are in soft heavy ground and there are practically no openings. On the extreme east side of the pit where the ground is harder, drifts and raises and some stopes do stand open.

Old drifts and raises are located on underground maps and churn drill holes drilled near them blasted

These drifts and raises are located from the underground maps and churn drill holes are drilled near them and blasted. As a precautionary measure this is also done in the soft ground. Drill holes are put down over old stopes, that have not caved through, in order to locate the top of the openings. Holes are then drilled to cover the stoped area and blasted ahead of shovel operations. Reliable underground maps are very necessary.

Old Timbers Troublesome

The second disadvantage is old mine timbers. These occur as a, more-or-less solid, level mat in old square set and top slice stopes and as two or three ft of crushed and matted timbers on the bottoms of the old draw level drifts in caved stopes. As the material left in pillars between draw points is usually good ore, these old timbers pose a sorting and crushing problem. It has been found necessary for shovel operators to sort out large timbers and to use wood pickers at the primary crusher and on the conveyor belts in the secondary. Since complete elimination of the wood is impossible, crusher tonnages are lowered by wood clogging the screens and building up in chutes and under the rolls. Where practical, provisional bench levels have been established just above or below the timber in order to dig it out with the least amount of ore for better separation. Occasionally the shovels dig out an old drill shop or storage area, which makes crusher operations very interesting for a few shifts.

Oxidized Ore A Problem

Another disadvantage is the oxidation that has taken place in the ore adjacent to the old mine openings. This natural oxidation has been greatly increased by about ten years of leaching, with the result that a good deal of the material that should be ore has to be hauled for waste. This material is dumped in areas planned for future leaching so that it will not be a complete loss. The oxidized ore that is sent to the mill is usually high in copper sulphate. This sulphate upsets the mill circuit causing high tails and necessitates the use of unusual quantities of lime to maintain the alkalinity of the circuit.

On the other side of the picture in the material just discussed, the first 50-ft bench above the old draw levels usually recovers as milling ore from 20 percent to 30 percent of the material left in pillars between draw points.

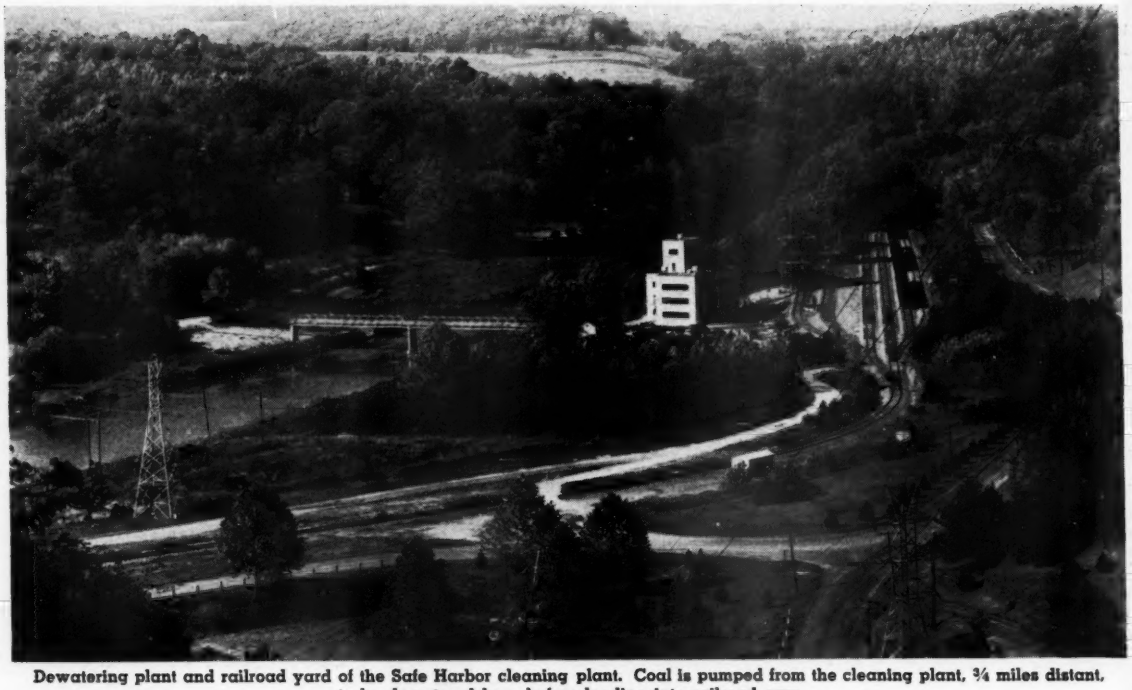
The second bench above the old draw levels recovers much smaller quantities of ore, as the pillars tend to taper off within 100 ft vertically of the draw points. In firmer ground, however, they often stand nearly vertical through the entire ore horizon and into the capping. These facts would be very important in planning any future pit work in old underground workings, as ore recoveries usually greatly exceed expectations.

This recovery has held true in spite of more than ten years of leaching the area. It is of interest to note that, although the pillars have been heavily oxidized from intensive leaching, very little copper has been removed from them while in general the copper values have been almost completely removed from the well-broken material. In many relatively small areas in the well-broken material the copper contents have been oxidized but not removed. This indicates that the material was reached by the solutions and, as in the case in the pillars, the copper was not carried on down because there was no flow of solution.

Pre-Broken Ground A Help

One of the most economical features of mining old caved areas lies in the fact that the bulk of the ground is already broken and requires little, if any, drilling and blasting. Much of our ground requires no blasting in the old stopes except for the pillars between draw points. In the total open pit cost figure this is quite a large item of expense and its partial elimination can make a radical change in open pit economic planning.

In summary those planning open pit operations in old caved areas should definitely take into consideration the cheaper mining costs afforded by the previously broken material and can surely count on some ore recovery from the old stopes. This depends in degree upon the hardness of the original ground and the thoroughness of the underground mining and no matter how thoroughly it was mined, there will be considerable ore tonnages remaining for pit recoveries. As against these advantages the disadvantages rank small and, except for the wood in the crusher and mill, can be eliminated at small expense with a little careful planning.



Dewatering plant and railroad yard of the Safe Harbor cleaning plant. Coal is pumped from the cleaning plant, ¾ miles distant, to be dewatered here before loading into railroad cars

Recover River Coal for Power Generation

Plant Designed to Recover 570,000 Net Tons of Coal Annually from Silt Containing 47 Percent Ash

By PAUL LEVIN and J. P. LEDVINA
Senior Engineer Coal Results Engineer
Pennsylvania Water & Power Co.

AN extremely interesting example of the recovery of a wasted natural resource and its conversion to a low cost fuel for the generation of electric power can be seen in southeastern Pennsylvania on the Susquehanna River. This example is made even more interesting by the fact that, to the layman, the natural resource being salvaged apparently had been lost beyond economical redemption. Yet the Pennsylvania Water & Power Co. has just completed a $6,000,000 plant for the recovery and preparation of this natural resource and has also placed in successful operation a $14,000,000 plant to use it. The material is "river coal," the fine anthracite which, until recently, was permitted to wash down the watercourses of the Pennsylvania anthracite fields. In the past this fine waste coal, which was unavoidably generated when coarser marketable coal was produced, often accumulated near the mines in huge banks. The natural forces of erosion and stream flow moved the fine coal into and down the rivers draining the anthracite fields. For many years, there have been in operation on the Susquehanna River two hydro plants, one at Holtwood, Pa., dating from 1910, and the other at Safe Harbor, Pa., constructed in 1931. The large lakes formed behind the dams of these hydroelectric projects made ideal settling basins for the fine river coal moving down the Susquehanna River—the tributaries of which drain about ⅕ of the Pennsylvania anthracite fields.

Using River Coal in 1934

Some recovery of river coal was under way in the Holtwood Pond under the sponsorship of the Pennsylvania Water & Power Co. before the company began its own river coal operations in 1934. The coal produced was burned, after being mixed with some bituminous coal, in the company's 30,000-kw Holtwood Steam Station which is situated adjacent to the Holtwood Hydro Station. The steam station began the use of 100 percent river coal in 1938, and by 1953, when the present river coal plant was placed in operation at Safe Harbor, the company had recovered over 3,000,000 tons of the stuff.

Large Reserves Available

A series of carefully conducted surveys of the silt deposits behind the Holtwood and Safe Harbor dams showed that millions of tons of river coal-bearing silt were deposited in these lakes. The Safe Harbor deposit was by far the larger, and in addition was growing as fresh inflow entered the pond. This latter fact seemed paradoxical in view of the determined and successful efforts of the Commonwealth of Pennsylvania in its Clean Streams Program to prevent the dumping of mine waste into the streams of the coal fields. Yet investigation showed that hundreds of millions of tons of this fine coal, dumped over the past century, were lying in the beds and on the alluvial plains of the myriad watercourses draining the hard coal fields into the Susquehanna. The continuing erosion of these de-

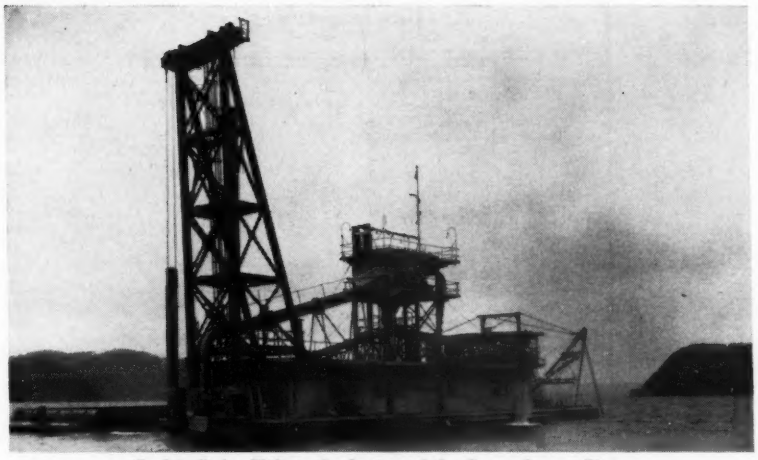
posits and of large coal banks resulted in appreciable quantities of river coal entering and depositing in the Safe Harbor pond. While this inflow lacked the coarse coal which was the life blood of the small river coal recovery operations up-river, and thus severely curtailed their business, it made a very usable feed for the fine coal recovery equipment installed by the power company.

Need More Coal

When additional power capacity was required on the company's system, it was decided to embark on a two-fold expansion project: A new river coal plant costing $6,000,000 would be built near Safe Harbor to supply coal for a $14,000,000 expansion to be made to the Holtwood Steam Station. The expansion to the steam station would consist of the addition of a new river coal-burning steam generator and a turbo-generator with a capacity of over 75,000 kw. The new river coal plant was designed to produce 570,000 net tons of river coal annually, operating 24 hours per day in the nine months during which the Susquehanna River is ice free at Safe Harbor.

Coal is dredged from the river bottom, barged to shore for washing and dewatering, and is then transported by rail eight miles to the Holtwood Steam Station. There the coal is pulverized and burned immediately or is used to build up a 200,000 ton storage pile to keep the steam station in service during the winter when the river coal plant is shut down.

The Pennsylvania Clean Streams program played a major role in the selection of the location for the river coal plant. The program required that none of the waste brought to shore could be returned to the river; all had to be disposed of on shore. Since it was desired to comply fully with the Commonwealth's regulations, a readily available refuse disposal area of substantial size was one of the chief prerequisites for the site of the river coal plant.



Coal is "mined" from the bottom of the Susquehanna River

Such an area was located near the Safe Harbor Pond. The site met other requirements also and was chosen for the plant location. Due, however, to the topography of the area, the designers were faced with these problems:

(1) In the area where it was desired to unload the barges, the river is bordered by steep hills rising precipitously from the water.

(2) The only real estate readily available for the washing plant lay on top of a hill 270 ft above the river.

(3) The only economical site for the railroad loading yard and spur lay about ¾ mile from the washing plant and 310 ft below it in elevation.

Break Plant Up

These problems were solved by dividing the plant into three parts, each serving a specific function. The lack of a shore area in which to construct a barge wharf and unloader was overcome by constructing the wharf from a line of eight self-supporting circular caissons or cells set out in the river 115 ft from the shore line and parallel to it. In the center of this wharf, a large double cell serves as the foundation for the unloading crane and the raw silt bunker.

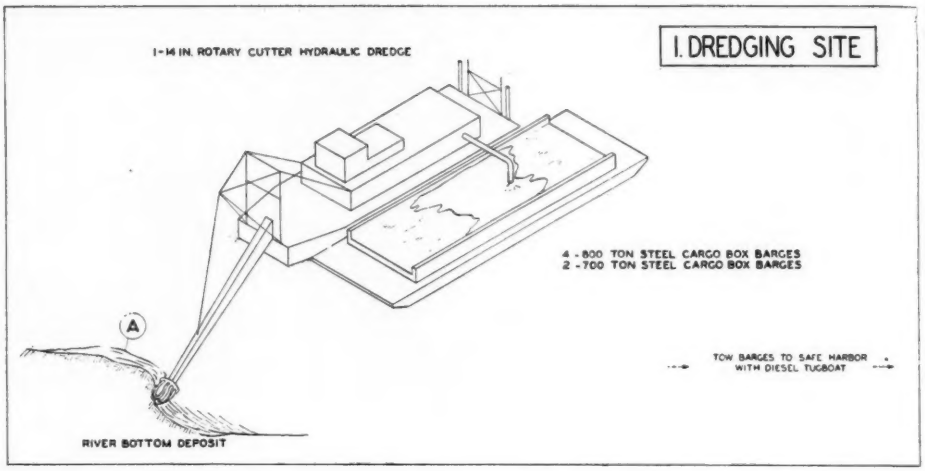
To reach the washing plant located on top the 270 ft high hill overlooking the river, the raw silt is pumped through a 12-in. pipe line by means of three series-connected 10-in. centrifugal pumps located in the unloader. This pipe line reaches the shore from the unloader over a bridge and then crosses under two branches of the Pennsylvania Railroad on its way to the washing plant. It passes under one track in a concrete conduit and under the other in a 180-ft tunnel before rising to the surface halfway up the hill in a shaft 65 ft high. The pipe line then climbs the rest of the way to the top of the hill on a bench cut into the hillside.

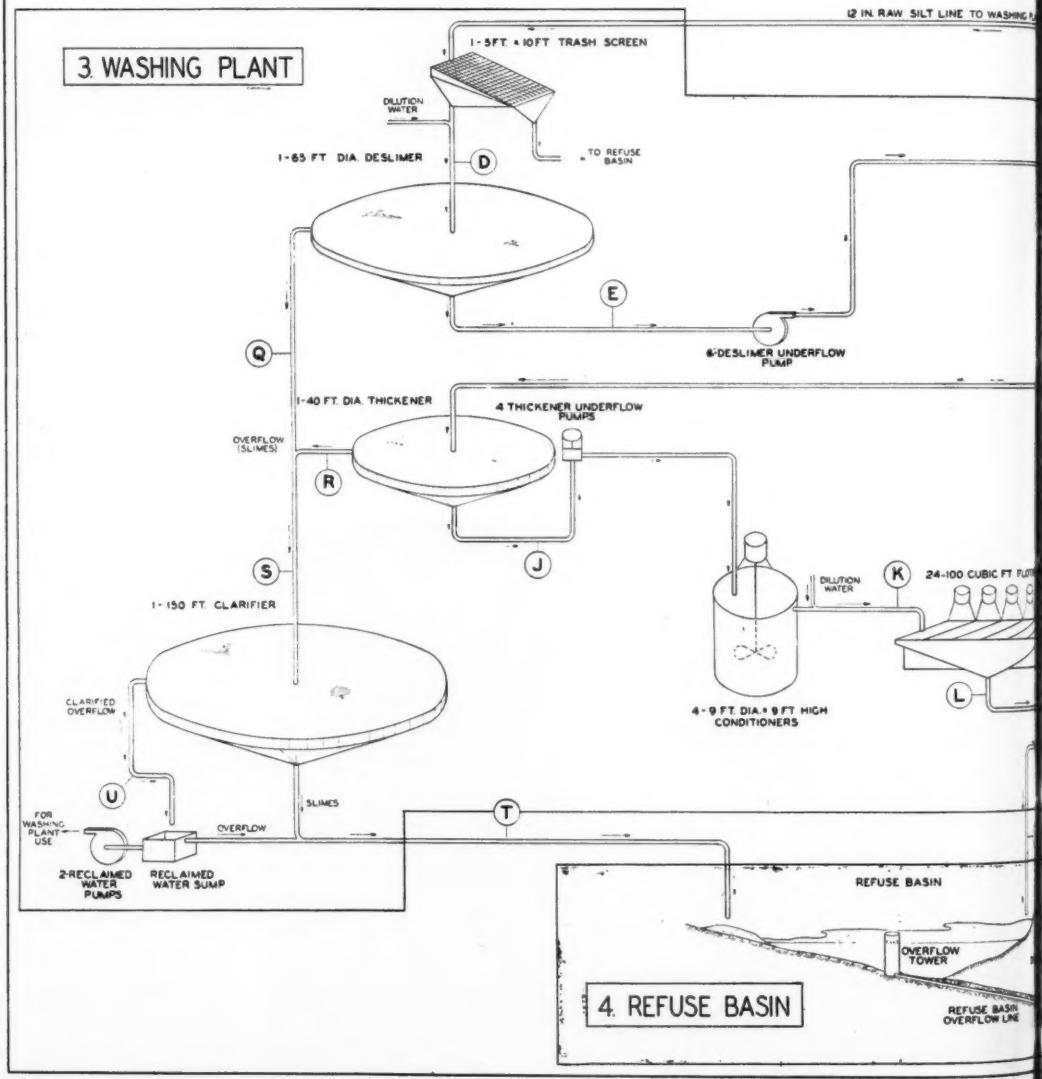
The third problem, the fact that the railroad loading yard had to be located ¾ mile from the washing plant, was met by transporting the washed coal from the washing plant to the rail yard by pipe line. Therefore, the dewatering section of the plant was separated from the washing section and located at the railroad yard so that the washed coal, after arriving via pipe line, could be dewatered before being loaded into cars.

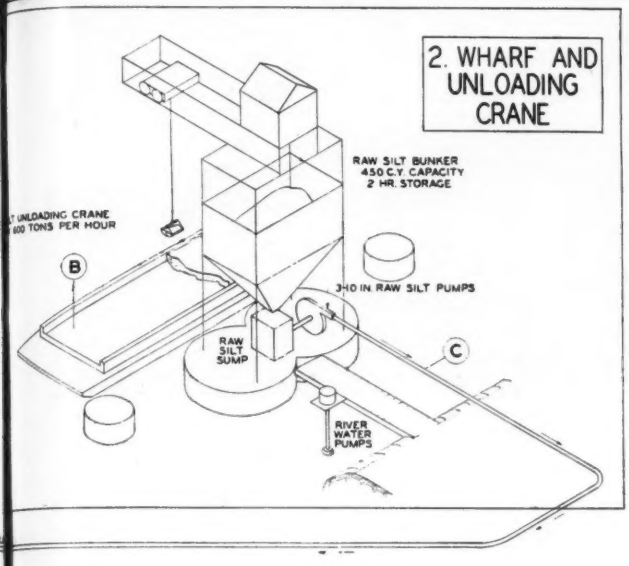
A bird's eye view of the river coal reclamation plant

Size Consist Varies

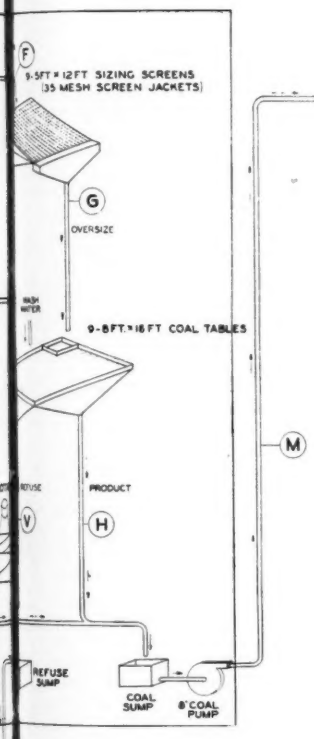
The design of the flow sheet and the choice of the type of equipment for the plant was made difficult by the nature of the material being treated. As the coal bearing silt lay in the bot-

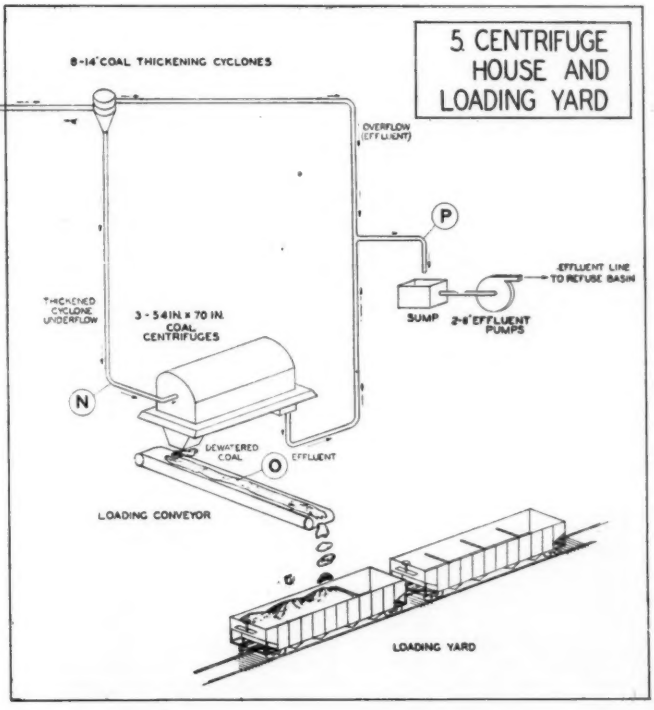

1. DREDGING SITE
1-14 IN. ROTARY CUTTER HYDRAULIC DREDGE
4 - 800 TON STEEL CARGO BOX BARGES
2 - 700 TON STEEL CARGO BOX BARGES
A
TOW BARGES TO SAFE HARBOR WITH DIESEL TUGBOAT
RIVER BOTTOM DEPOSIT


12 IN. RAW SILT LINE TO WASHING
3. WASHING PLANT
1-5FT. x 10FT TRASH SCREEN
DILUTION WATER
1-65 FT. DIA. DESLIMER
D
TO REFUSE BASIN
E
6" DESLIMER UNDERFLOW PUMP
Q
1-40 FT. DIA. THICKENER
4 THICKENER UNDERFLOW PUMPS
OVERFLOW (SLIMES)
R
J
S
1-150 FT. CLARIFIER
DILUTION WATER
K
24-100 CUBIC FT
4-9 FT. DIA. x 9 FT. HIGH CONDITIONERS
L
CLARIFIED OVERFLOW
U
SLIMES
T
FOR WASHING PLANT USE
OVERFLOW
2-RECLAIMED WATER PUMPS
RECLAIMED WATER SUMP
REFUSE SUMP
REFUSE BASIN
OVERFLOW TOWER
4. REFUSE BASIN
REFUSE BASIN OVERFLOW LINE



REFERENCE	TONS/HR. DRY SOLIDS	% ASH IN DRY SOLIDS	% DRY SOLIDS BY WEIGHT	G.P.M.
A	296	49	66	-
B	217	42	60	-
C	188	42	17	4200
D	188	42	10	7400
E	149	34	30	1740
F	149	34	14	3770
G	50	17	60	280
H	46	13	25	650
I	99	42	11	3490
J	85	37	40	680
K	85	37	25	1190
L	56	16	35	550
M	102	15	25	1440
N	101	15	38	900
O	100	15	84	300
P	2	50	1	1140
Q	39	65	2	5660
R	14	55	2	2810
S	53	63	2	8470
T	53	63	20	950
U	0	-	0	7520
V	4	65	10	140
W	29	78	16	640
X	33	76	11	1100





RIVER COAL PLANT AT SAFE HARBOR

MECHANICAL EQUIPMENT & FLOW SHEET

tom of the Safe Harbor pond, its average analysis as determined by careful surveys was as follows:

Ash content	47%
Moisture content	39%
Fineness—Plus 28 Tyler mesh	10%
Minus 28 plus 200	51%
Minus 200 mesh	39%
Heating value	4,700 Btu per lb

From this raw material, it was desired to produce a finished product with the following analysis:

Ash content	16%
Moisture content	18%
Maximum minus 200 mesh	5%
Heating value	10,000 Btu per lb

Although the raw silt was high in ash, its most noticeable single characteristic was its high content of minus 200-mesh material. These minus 200-mesh slimes were considered undesirable, and every effort was made to remove them from the washed coal, first because of the great difficulty involved in cleaning them, and second, even if they could be cleaned, their presence in the finished coal would make it so "sticky" that handling would be difficult. The flowsheet design was further complicated by the extreme variation of the silt in the river bed. Within a few feet, one can encounter silt varying from relatively coarse granular coal, free from slimes, to a muddy silt containing over 95 percent minus 200-mesh slimes.

First Treatment at Dredge

As finally selected, the flowsheet begins with the dredging of the coal bearing silt from the river bottom by a 14-in. diesel powered hydraulic dredge. The silt is thoroughly dispersed by the action of the dredge pump and is passed through a rotary trash screen before entering barges. The barges act as preliminary classifiers for the silt and a substantial amount of the unwanted minus 200-mesh slimes is washed away over the end weirs of the barges.

A 50-ft dam impounds washer refuse in a nearby valley. In time the dam will be built up to a height of 275 ft

The partially deslimed silt in the barges is then unloaded into a bunker and fed to the raw silt pumps to be pumped to the washing plant on top the river hills.

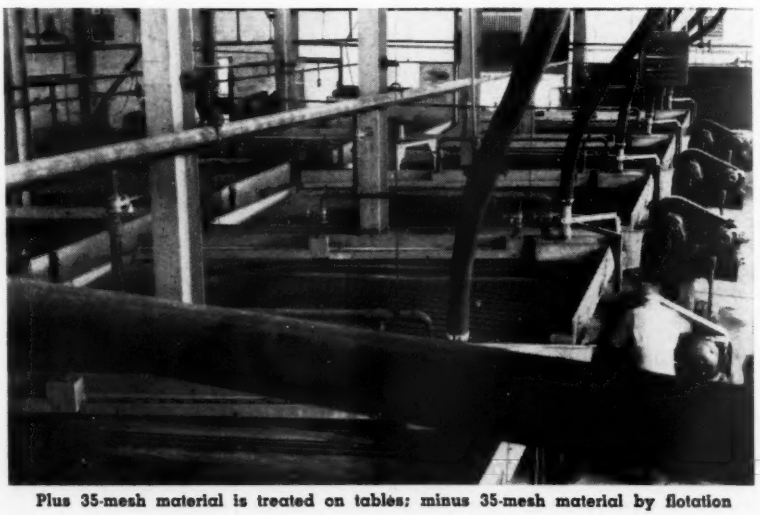
The three raw silt pumps in series develop a total head of 350 ft and are each driven by a 250-hp motor. These pumps, as well as all other pumps in the plant handling abrasive solids, are installed in duplicate permitting a set of pumps to be removed from service for inspection and maintenance at any time without interfering with plant operation. All slurry pumps in the plant were supplied by Barrett, Haentjens and Co.; water pumps were supplied by the Worthington Corp.

Two Size Separation

Once at the washing plant, the raw silt is further detrashed and is then deslimed in a 65-ft diam Dorr hydro-classifier. The deslimed silt is pumped from the bottom of the hydro-classifier by a six-in. centrifugal pump and is sent to nine Allis-Chalmers Low Head 5 by 12-ft vibrating screens for separation into plus and minus 35-mesh fractions. The screens are fed by a mechanical distributor which divides the feed into nine equal parts, or alternatively, into eight equal parts if it is desired to take any one screen out of service. The vibrating screens are of the multi-tier type in which the material cascades over five stainless steel screen panels stepped down in the direction of flow with supplemental wash water being added to trays between the screen panels. The added wash water prevents "balling" of the silt before screening is completed.

Screen oversize, substantially plus 35-mesh, is fed by gravity to nine Deister Concentrator coal washing tables, each table being fed directly from its own screen. This screen-table unit design permitted simplification of the washing plant layout. The tables make a final separation of the screen oversize and produce a cleaned coal and a waste. No effort is made to separate and re-treat a middling.

The minus 35-mesh screen undersize is first thickened in a Western Machinery Co. 40-ft diam hydro-classifier to approximately 40 percent solids and then is pumped to the froth flotation section of the plant by four sets of six-in. duplex diaphragm pumps. The flotation plant is divided into four parallel banks of six Denver Equipment Co. 100 cu ft Fahrenwald flotation cells, each bank served by its own conditioner and its own set of diaphragm pumps. This design allows the removal from service of any bank of flotation cells without requiring the plant to shut down.



Plus 35-mesh material is treated on tables; minus 35-mesh material by flotation

Flotation Problems

Flotation of the fine river bed anthracite coal presented a unique problem. The coal had been lying in the river for many years, some particles perhaps as long as a century, and the particles had been smoothed and coated with slimes by the action of the river. There were none of the

freshly broken surfaces so desirable in froth flotation. Earlier tests had indicated that mechanical "scrubbing" of the particle surfaces before flotation was helpful in the process. Scrubbing, to the extent found most effective in the laboratory, was considered uneconomical, however, and as a compromise the coal is pre-conditioned for over 15 min with No. 2 fuel oil and steam - distilled pine oil. Dilution water is added to the feed to the flotation cells to bring the solids content of the feed down to 25 percent. The flotation cells are all supercharged.

Flotation is carried out in one pass with no recirculation or "cleaning." In order to evaluate the effect of scrubbing on a commercial scale, a Fagergren two-cell flotation machine was installed in one flotation bank prior to the conditioner to act as a scrubber. Test work is being carried out on the scrubber to determine its effect on flotation efficiency.

Dewater Mechanically

Cleaned coal from the tables and from flotation is combined in one sump, while the table refuse and flotation tailings are combined in another sump. The washed coal is then pumped 4000 ft to the dewatering plant adjacent to the railroad yard. There the coal is first passed through eight 14-in. Heyl & Patterson cyclones where excess water is removed and the coal is thickened from approximately 25 percent solids in the pipe line to about 40 percent solids leaving the cyclones. This thickened coal slurry is then piped to a feed distributor which feeds three Bird solid bowl centrifuges for the final dewatering of washed coal.

A thrustor mechanism, interlocked with a device measuring the load on the centrifuges, diverts the centrifuge feed to an outdoor pit if the centrifuge load becomes excessive. This arrangement, which prevents dangerous overloading of the centrifuges, is made doubly important by the long pipe line and thus the large load in transit to the dewatering plant. The diverted feed is reclaimed at intervals.

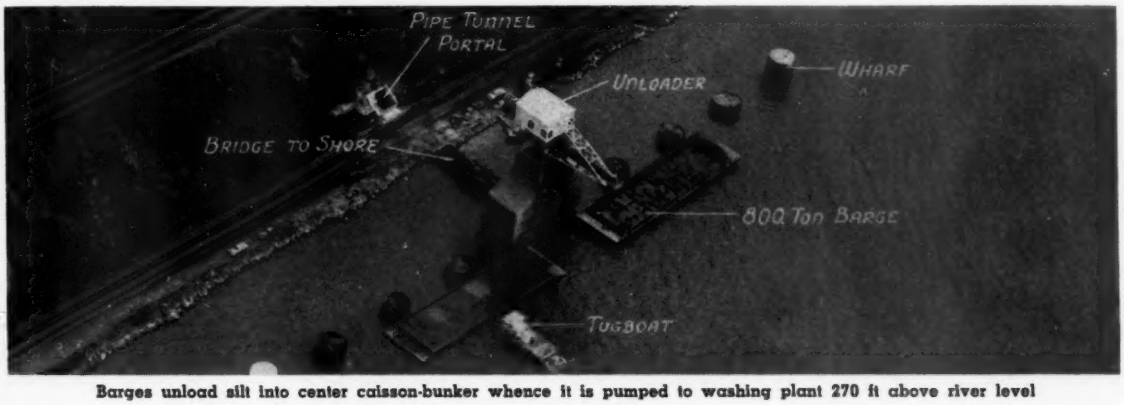
Finished coal, dewatered to 18 per cent moisture, drops on a 24-in. belt conveyor and is conveyed to a loading tower to be dropped into railroad cars. A glass enclosed control room on the loading tower permits the operator, by means of central hydraulic and electrical controls, to load cars continuously on either of two loading tracks. The railroad yard has a total of 14,000 ft of track for the loading and storage of cars and is equipped with a car puller and a 25-ton diesel-hydraulic locomotive.

Refuse Disposal

Importance of a refuse disposal area as a factor in determining the plant site has been pointed out. The area chosen was a bowl shaped valley lying between the washing plant and the dewatering plant. Since it is below the washing plant in elevation, practically no pumping is needed to move the wastes from washing plant to the refuse area. Plant wastes, the deslimer and thickener overflows, are concentrated in a 150-ft diam Dorr clarifier and are then piped to the refuse area formed by constructing a 50-ft high earth dam across the mouth of the valley. The centrifuge and cyclone effluent is also pumped to the refuse area. The muds settle out in the pool formed in the refuse basin. The effluent enters an overflow silo and is conducted under the dam to a nearby creek. This effluent meets the specifications required by the Commonwealth of Pennsylvania Clean Streams Program.

Meanwhile, the sand refuse from the coal washing tables and flotation cells is pumped to the top of the dam which forms the refuse basin. Here the sands are settled out in troughs and are spread and compacted by bulldozers to build up the dam as the slimes accumulate behind the dam. In about 40 years, the initial 50-ft high dam across the mouth of the valley will be built up to a height of 275 ft, giving a refuse disposal area with a capacity of 21,000,000 tons of waste. In view of the ultimate height of the refuse dam and the problems associated with the building of so high a structure, an internationally known consultant, Dr. Arthur Casagrande, was retained to advise the company on the design and construction of the dam.

Since the river deposits are expected to last about 40 years, the plant was constructed for permanence and low maintenance over a long period. The buildings are constructed of steel with reinforced concrete floor slabs and with sidings of corrugated asbestos. The large deslimer and clarifier tanks were also constructed of reinforced concrete. The floating equipment — dredge, tugboat and barges—are of all-welded steel construction. The electrical installation is the most modern available with individual load center unit substations serving a total connected electrical load of 4200 hp. A single interconnected public address system has proved invaluable in coordinating the operation of the scattered units of the shore plant. Two-way radio serves to tie the dredge and tugboat into the communication system. Each of the three shore operating centers, as well as the dredge and tugboat, is equipped with complete locker and washroom facilities for the operators.



Barges unload silt into center caisson-bunker whence it is pumped to washing plant 270 ft above river level

Operating Results

The plant was placed in experimental operation in October 1953 to reveal the troubles which are typical of this type of plant. Problems were all of a secondary nature and were for the most part solved when the plant began commercial operation in the spring of 1954 after the usual winter shut-down.

In 1954, up to the end of September, the plant, operating approximately 128 hours per week, has produced 385,000 tons of clean river coal, which meets the design specifications very closely, and over 370,000 tons of waste, which have been deposited in the refuse area. Altogether more than 755,000 tons of silt have been moved from the river bottom to the raw silt bunker.

Colorful outside exhibit area attracted throngs of interested visitors

Mining Show Huge Success

San Francisco Rolls Out the Red Carpet for Mining Men

DURING the week of September 20 some 7500 mining men and their ladies met in San Francisco for the biggest and best Mining Show the West has ever seen. From the time the doors of the Civic Auditorium opened on Monday morning until the lights were dimmed on Thursday evening, the meeting rooms, the exposition halls and the outdoor exhibit area were crowded with interested visitors. Among them were leading legislators and government officials, mining company presidents, superintendents, shift bosses and drill runners, prospectors, mechanics, electricians, educators and students, everyone, in fact with an interest in the mining industry. They came from every mining area in the United States and large numbers made the trip from Canada, Mexico, South America and Europe. All were intensely interested in the machinery exhibits and every meeting room was crowded, as delegates sought to learn the answers to the problems confronting the mineral industries.

These problems were thoroughly aired at the 26 sessions and conferences planned by the highly representative Program Committee headed by National Chairman Frank R. Milliken, vice-president of Kennecott Copper Corp. The chairmen of a number of the sessions implemented the decisions made by the Program Committee by organizing the meetings over which they presided. To them, to the speakers who cooperated so wholeheartedly, as well as to the Program Committee goes the credit for the outstanding success of the convention.

Exposition Tops Too

But the addresses and discussions, interesting and valuable as they were, made up only a part of the show. The 186 exhibitors and sponsors who supported the exposition, in which every type of mining and milling machinery and auxiliary supplies and instruments was shown, went all out to provide convention visitors with a comprehensive education in the latest aids to the economical finding, mining and treating of metal ores and industrial minerals.

The exposition occupied all available space in the huge San Francisco Civic Auditorium and also the entire 40,000 sq ft area in front of the building. Among the colorful displays were newest locomotives, blasthole and exploration drilling equip-

ment and supplies, latest types of on and off-track haulage equipment and conveyors, mucking machines, electrical and safety devices, instruments for uranium prospecting and ultraviolet lights, rod mills and ball mills, flotation cells and heavy-media equipment. There were tractors and scrapers, trucks and trailers. There were operating models of huge power shovels and draglines. There were delicate balances and surveying instruments. There were attractive displays illustrating applications of various consulting services. The list is too long to be recounted here in full, but every exhibitor proudly showing the equipment which his company had designed and built had representatives on hand to answer questions about the units on display, or to discuss intelligently their application to the problems of the mining visitors. Many items on exhibit were being shown to the industry for the first time.

Opening Sessions

Early arrivals were greeted by members of the Welcoming Committee, headed by Jack How, president, Western Machinery Co. and Larry Kett, president, Mountain Copper Co. The Publicity Committee, under S. H. Williston, president, Cordero Mining Co. and P. R. Bradley, Jr., president, Pacific Mining Co., had alerted the press to the importance of the meeting and it received excellent coverage both in California and in the press throughout the country.

Western Division Chairman Donald H. McLaughlin, president, Homestake Mining Co., formally opened the convention on Monday morning. In his opening remarks he pointed out that from a historical standpoint, San Francisco can validly claim to be the capital of the western mining world. As such, he felt it altogether proper for the Mining Congress to hold this great meeting there as a reminder that here the best mining traditions of the country were born.

Hon. J. Eugene McAteer, acting mayor of San Francisco, warmly welcomed the American Mining Congress to the "Golden City" and urged convention visitors to get to know San Francisco and its people well. In this he was seconded by Lieutenant Governor Harold J. Powers who extended the welcome to cover the entire State of California.

In answer to the welcoming addresses Howard I. Young, president of the American Mining Congress; Frank R. Milliken; Ralph K. Gottshall, president, Atlas Powder Co. and chairman of the AMC Manufacturers Division, and Donald S. MacBride, president, Hercules Cement Co. and chairman of the AMC Cement Producers Advisory Committee, warmly thanked the Californians for their welcome. Mr. Gottshall in his turn invited careful inspection of the exhibits. Mr. MacBride pointed out that a large majority of the nation's cement producers are now members of the Mining Congress and take an active part in its work. He said that it is a privilege to work with other segments of the mining industry in furthering its long-range interests and those of the general public.

Chairman McLaughlin then introduced a number of the distinguished guests present. Present at the meeting were 24 high ranking members of the Congress and executive agencies who took active parts, along with prominent mining men, in the convention discussions. Altogether there were more than 50 leading officials of Government agencies dealing with mining matters who joined in the convention proceedings.

With Howard I. Young taking over the chair, the rest of the opening session was devoted to a program dealing with trends in Washington. U. S. Senator Thomas H. Kuchel of California outlined the growth of the United States stockpiling program since passage of the Stockpiling Act in 1946. He noted how the emphasis in administering the program has shifted toward "developing our domestic resources to the greatest extent practicable." He pointed out that the prosperity and security of the entire country depend on the activity and success of mining and called for the "aggressive cooperation of the mining industry."

The Senator called attention to the efforts made by Government to help in developing the mineral potentialities of the country by sharing in the cost of exploration and mentioned the incentives, implicit in the Internal Revenue Act of 1954, to investment in mining enterprises.

Felix E. Wormser, Assistant Interior Department Secretary for Mineral Resources, outlined the work of the Cabinet Committee charged with forming a national minerals policy. "This is the first time," he said, "that our Government has given such high level consideration to mineral problems, *per se*."

He pointed out that any policy, to be effective, must constantly meet changing national and international conditions, so there isn't too much that can be set down in black and white with the feeling that the subject has been disposed of permanently.

In answer to the question, "What steps should the Federal Government

Exhibits in arena attracted lots of attention

take to assure an orderly and vigorous development of our domestic mineral resources?" he pointed out that the Administration had sought incorporation into the tax bill of a number of provisions to encourage additional capital investment in American industry.

He went on to say that the Administration will continue to encourage the exercise of private initiative in the development of our domestic mineral resources in a manner consonant with true conservation. "This is what has made our country great," he said, "Federal ownership, where it has been tried, tends to cause stagnation. Conservation and Federal ownership are *not* synonmous."

Brief accounts of the Monday afternoon and succeeding sessions appear in a special section of this issue beginning on page 69.

Adopt Policy Statements

At appropriate points during the convention sessions, statements of policy on matters of national importance to the mining industry were presented for consideration. Based on suggestions received from mining men all over the country, these statements had been drawn up by the Resolutions Committee under the chairmanship of Kenneth C. Kellar of Lead, S. Dak. At its meetings on Saturday and Sunday before the convention, the Committee culminated months of hard work by putting into succinct and forceful language the considered views of the mineral industry on national policies.

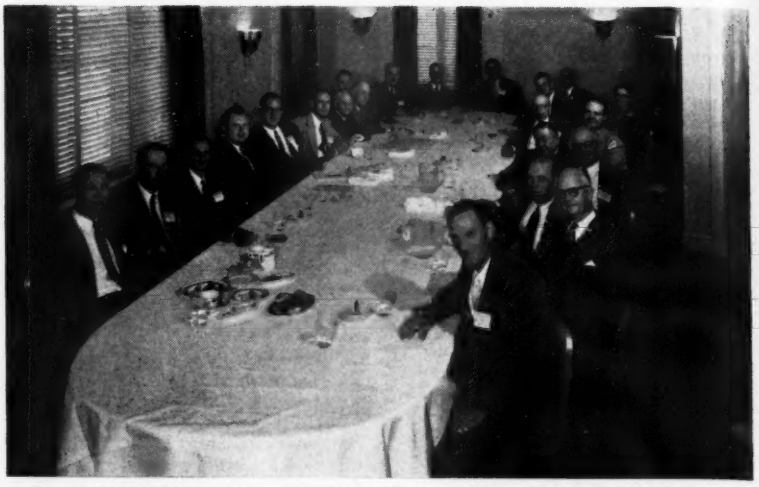
The combined Declaration of Policy, as finally adopted by the convention and reproduced on pages 63 to 68, will be submitted to the Board of Directors at the Annual Meeting, and the policies then adopted will guide the American Mining Congress during the coming year.

State Secretaries Confer

On Sunday morning prior to the convention, representatives of the various State Mining Associations met to discuss problems of common interest. Albert F. Knorp, secretary of the California Chapter of the American Mining Congress, presided. In the course of the meeting, spokesmen for each of the State associations present was called on to speak briefly on the particular problems in his section of the country and to suggest ways in which all could cooperate for the best interests of the industry. The questions of stockpiling, tariffs, pending legislation on both the State and national levels all came in for discussion.

Board of Governors Meets

On Thursday the Board of Governors of the Western Division convened at a luncheon meeting, at which Donald H. McLaughlin presided. Roy A. Hardy, consultant, Getchell Mine, Inc., Reno, Nev., was elected chairman of the Western Division for the coming year. As chairman, he will play a leading role in arrangements for the next Mining Congress Convention, which is to be held in Las Vegas, Nev., October 10-12, 1955. Also duly elected were the candidates for the Board of Governors nominated by the various State associations.



Secretaries of State mining associations met to discuss their mutual problems at breakfast on Sunday morning, preceding the Convention

Plans for the Las Vegas meeting, which will be a convention only without the biennial exposition, were discussed by Executive Vice-President Julian D. Conover and approved by the Board. This will be the first time an American Mining Congress meeting has ever been held in that city. Hotel accommodations will be more than ample and the attractions of this city in the Nevada desert, close by the Hoover Dam, are well known. As usual a Housing Bureau will handle all hotel reservations and room assignments will be made early next summer.

Consideration was also given to plans for 1956 and 1957, which will be announced at a later date.

President Howard Young briefly addressed the group. He thanked all the committee members for their efforts which contributed so much toward making the 1954 Mining Show the huge success it was. He urged all to continue the fine support they have given to the aims and ideals of the Mining Congress in its work in Washington, and to work ceaselessly for the continuation of Governmental policies favorable to the free enterprise system as we know it.

Frank Milliken and Ralph Gottshall spoke briefly and expressed their thanks for the fine cooperation extended in connection with the convention sessions and exposition respectively. Chairman McLaughlin commented on the excellent job the local people had done, and proposed

The Board of Governors, Western Division AMC, met on Thursday

a special vote of thanks to Kenneth Kellar for his leadership in the Resolutions Committee — a suggestion which was adopted promptly and enthusiastically.

Ladies Events

All the ladies who attended the meeting were invited to attend the convention sessions and the exposition, and many of them were in evidence at the Civic Auditorium during the four days of the show. There was also a delightful program of social events arranged by a Ladies Committee, headed by Mrs. Frank Girard as honorary chairman and Mrs. Philip Bradley as general chairman.

A tea and reception was held on Monday at the California Palace of the Legion of Honor, following a tour to Twin Peaks, through Golden Gate Park, past Cliff House and Seal Rocks and other scenic attractions of San Francisco.

On Tuesday the ladies enjoyed a drive across the San Francisco-Oakland Bay Bridge, along the Skyline Drive overlooking Berkeley and the Bay enroute to and from luncheon at the beautiful Claremont Hotel. An interesting part of this trip was a drive through the University of California Campus.

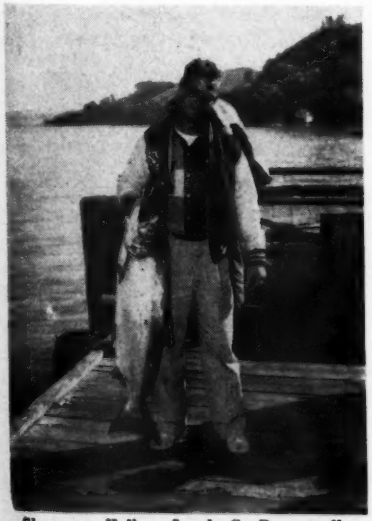
After coffee and rolls at the St. Francis Hotel on Wednesday, a specially arranged tour was made to many of San Francisco's intriguing shops and stores. On Thursday there was another guided shopping tour and a luncheon and style show in the famous Peacock Court at the Mark Hopkins Hotel.

The ladies enjoyed a Reception and Tea at the California Palace of the Legion of Honor

Mrs. Gloyd Wiles and Mrs. Felix Wormser were particularly interested in hats during the shopping tour on Wednesday

Salmon Fishing Miners

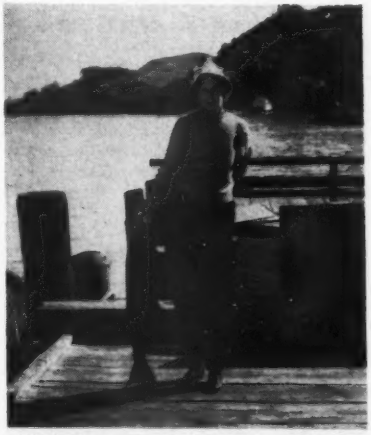
On Friday morning, September 24, 175 of the salmon-fishingest mining men and ladies ever gathered together in one fleet set sail from Sausalito to try their luck with the big fish reputed to haunt Pacific waters outside the Golden Gate. The Mining Congress fleet returned to its home port about 2:30 with a record catch.



Sherman Kellar, Lead, S. D. proudly displays his prize-winning catch, a 31-pounder

Sherman Kellar of Lead, S. Dak., won the Salmon Derby prize for the biggest fish caught. His fish weighed 31 lb and earned him $100 in gold nuggets. M. T. Kasper, Dart Truck Co., took second honors with a fish that tipped the beam at 30 lb 9 oz, only seven ounces less than the winner. According to reports received, none of the parties returned empty handed. Mrs. Carroll Copps (he's with Atlas Powder Co.) caught a 21 lb Chinook salmon to lead the ladies' contingent.

When all the returns were in, it was decided that the 1954 Salmon Derby was a complete success. Max Holsinger of Mining World and his committee certainly lived up to the promises they made, providing the boats, the weather, and the fish in just the right proportions. Many of the fishermen among the miners had not been aware of the excellence of San Francisco's salmon fishing. The



Mrs. Copps and her 21-lb Chinook Salmon

success of the Derby was a revelation to them and all are looking forward to the next opportunity to fish these waters.

Many Enjoy Trips

While the fishermen were out in the Pacific, another group of mining men were boarding two buses, which took them on an all-day tour of some of the historic mining districts of California. The group inspected one of the huge dredges that have made placer mining history on the Yuba River near Marysville. They then traveled to Grass Valley, where with others who joined the party, they were luncheon guests of Empire Star Mines Co. and Yuba Manufacturing Co. at the famous Bret Harte Inn. Before returning to San Francisco, by way of Auburn and Sacramento, they also had a chance to see some of the famous Mother Lode country, scene of so much of the early mining history of California.

There were other bus trips on Friday that carried groups of interested mining men to the Wire Rope Plant of the Columbia-Geneva Steel Division, U. S. Steel Corp. at Pittsburg, Calif., the smelter and zinc fuming plant of the American Smelting and Refining Co. at Selby, and the Shell Development Co. research center at Emeryville.

All trips were arranged by Herb Sawin, Yuba Manufacturing Co. and his hard-working Trips Committee. The consensus of those who went along was that they had done a remarkably fine job.

Many of the mill men among the conventioneers took advantage of the opportunity to round out convention week at the Annual Fall Meeting of the Minerals Beneficiation Division, AIME, which was held on Friday at the Fairmont Hotel.

By Saturday the majority of conventioneers had left the city enroute to their homes, full of new ideas and planning to put into practice the lessons learned in San Francisco. A number of them stopped off in Reno, Nev., to attend the dedication of the new Rare and Precious Metals Laboratory of the U. S. Bureau of Mines.

Social Events

"Diversions are properly applied to ease and relieve those who are oppressed by being too much employed." So says an old proverb. Although it can hardly be said that the mining men and ladies who attended the convention were too much employed, in the usual sense, the entertainment program designed for their diversion provided a series of welcome respites from the more serious business of the meeting.

On Sunday evening the convention's social side got into full swing with a reception and cocktail party at the Mark Hopkins Hotel, given by the American Mining Congress in honor of the committee members, speakers and others who had contributed so much time and effort to making the meeting a success.

Interior Department Assistant Secretary Felix E. Wormser and the late Senior Senator from Nevada, Pat McCarran, took active parts in dedication of the new Rare and Precious Metals Research Laboratory at Reno, Nev., on Saturday

The big social event on Monday evening was the Miners Jamboree at the Palace of Fine Arts of the 1915 World's Fair. The huge building was decorated in keeping with the theme of a Chuck Wagon Dinner, in the tradition of the Old West. Bars to dispense liquid refreshments were located in strategic positions and a battery of cooks at one end of the room broiled 1900 steaks for as many hungry miners and their ladies.

All the cooking was done over an open fire and provided quite a spectacle in itself. After dinner was out of the way the entertainment program began. There were jugglers and dancers and acrobats and the Wiere Brothers. Each act was funnier or more impressive than the last. A fine orchestra provided danceable music before and during dinner—and after the show. The test of how good a time was had by all was found in the comments heard the next day. Everyone was complimentary.

Tuesday night, as usual, was kept open for the numerous informal gatherings that always mark these Mining Congress Conventions. Each of the city's fine hotels had its quota of such parties and again everyone had a wonderful time.

The dinner-dance on Wednesday was also a sellout. So many wished to attend that the party occupied all five of the large ballrooms of the Palace Hotel. The dance music was topnotch and the entertainment, featuring Lucille Norman, was again excellent. There were no speeches, no head-table, and a wonderful time was had by all.

On Thursday evening many of the convention-goers attended the per-

(Continued on page 68)

Everyone had a wonderful time at the Miners Jamboree on Monday night

AMERICAN MINING CONGRESS

A Declaration of Policy

Adopted at San Francisco, California, September 20-24, 1954

PRODUCTION of minerals and metals is recognized as essential to the welfare and security of the nation. The past few months have seen improvement in the stability of the domestic economy, which unfortunately has not been reflected in certain phases of the mining industry. The revision of the Revenue laws and the elimination of the excess profits tax should have a beneficial impact on the national economy. We are encouraged by the fact that the present administration is sympathetic toward the problems of private industry and that the creeping socialism of the past two decades has to some extent been arrested.

Progress has been made in the announced policy of the administration to remove Government from business; in the curtailment of Federal expenditures and the elimination of waste, extravagance, and corruption; in the removal of many Government restrictions on private enterprise; and in the removal of disloyal employes from Government positions. We commend those responsible for these accomplishments.

The mining industry, however, has been hampered in its efforts by the fact that the Federal Government still lacks a constructive domestic mineral policy. We are happy to know that an attempt is being made to work out such a policy and we commend the Senate Minerals, Materials and Fuels Economics Subcommittee for its intensive study of this problem.

We urge that Government policies be directed toward affording the domestic mining industry at least the same consideration given by our Government to foreign producers.

The increasing conflict between the free world and communism remains a serious threat to peace and to our own national welfare and existence. It requires ever-increasing economic and military strength. We commend our national leaders in their unrelenting efforts to combat and eliminate communistic doctrines and influences wherever found.

GOVERNMENT EXPENDITURES

We appreciate the efforts which have been and are being made by the Congress and the Administration, even under disturbed conditions, to reduce expenditures so they will not be more than necessary to meet essential functions of government, adequately and efficiently, honestly and fairly, without waste or extravagance and without political favoritism. Further unremitting efforts and effective action are still needed to accomplish that result. The essential needs for the present and immediate future are so great they leave no place for extravagance, waste or unnecessary expenditure. Citizens and civic organizations, the Administration and the Congress, all should insist that such standards be observed.

Congress must have a competent staff to review and consider requests for appropriations and to assist it and its committees in carrying out these principles. We commend what has been done along this line and urge further action fully to meet the need.

TAXATION

Our Federal tax system has been greatly in need of revision in order that it might continue to yield the revenues needed and not impair the system of private enterprise and individual initiative under which our country had developed its great resources, its productivity and prosperity and the welfare of our people. We are deeply appreciative of what has been done by Congress and the present Administration in formulating the new Internal Revenue Code of 1954 as at least a beginning to restore normal incentives for economic growth and development.

We believe there has been too much hesitancy to make needed changes in the law because of fear of some assumed loss of revenue. The entire productivity of our revenue system depends on having tax laws which will neither by their tax rates nor their substantive provisions discourage the investments, the risk and the effort necessary for income production activities. There are still further changes which should be made to accomplish this result, including the following:

Many of our tax rates are still too high to leave incentive for maximum economic effort and initiative.

The over-all tax rate on income of the individual or of the corporation should in no case exceed 50%.

While a start has been made in an allowance to stockholders on dividends with respect to taxes paid by the corporation, the principle should be further extended, and depletion allowed to a mining corporation should be carried through to the stockholder on some equitable basis.

Substantial improvement has been made in depreciation provisions and in their administration, but there is still need that the tax benefit rule should be fully applied.

The limitations on deductibility of exploration expenses have been somewhat eased, but such limitations should be completely eliminated.

Tax exemption should be granted a new mine for three years after beginning of profitable operation.

Capital gains should be taxed at more moderate rates.

It is too early to give full appraisal of the provisions of the new Code. No such broad revision of the law could possibly be made in perfect form. As errors or inequities are disclosed, they should be corrected, retroactively when appropriate, and we consequently appreciate the statement by the Chairman of the Senate Finance Committee declaring that it is the intent that this be done.

The depletion provisions of the new Code are intended more fully and equitably to make allowance for depletion but require further amendment to eliminate certain newly-created inequities. We note, with strong approval, the express intent of the Treasury that with respect to the provisions relating to depletion, as with regard to other provisions of the law, it is the intent to apply and administer them in accordance with the intent of Congress.

We commend what Congress and the Administration have done and are doing to provide that taxes will both be imposed and administered fairly, equitably and honestly. The efforts of the Administration are necessary to prevent fraud, dishonesty and tax evasion,—but this should be done, as we believe is the intent of the present Administration, with a minimum of difficulties and disturbances to taxpayers who are endeavoring fairly and honestly to report their income and pay the appropriate taxes.

Our Government should cooperate with each foreign government which sincerely wishes to attract the investment of private funds and to encourage private enterprise by the creation of the necessary climate and the removal of barriers and road-blocks. Fears of confiscation, monetary controls and restrictions, excessive taxation and other economic and political barriers created by other countries must and can be removed. To this end our Government should enter into a mutually satisfactory treaty with each such country, and we commend the action of Congress in authorizing and encouraging such treaties.

If the effort to encourage the investment of private funds and to promote private enterprise abroad is successful, it will mean stability, prosperity, and higher standards of living, health, and education for our friends abroad; and, for us, a replacement of government aid by private investment, a direct saving in dollars for our Treasury, and increased revenues from increased economic activity.

With respect to other countries, the elimination of discriminatory taxes and of double or multiple taxation, through tax credits and treaties, should be continued and actively extended.

PUBLIC LAND POLICY

Our success in the discovery and development of uranium ores and the intensity of the present search for new sources of minerals evidence the importance and soundness of our General Mining Laws. The claim location and patent system established by these laws continues to provide incentive for men to risk money and effort to seek and develop the mineral resources of the public domain and reward to those who succeed.

We are opposed to any material interference with the right to locate or the right, through patent, to acquire legal title to a mining claim, including the surface. We believe that, under mining locations which lack either validity or good faith, abuses have been permitted and encouraged as a result of past failure of some Forest Service officials to bring to the attention of the Department of the Interior specific cases where there have been interferences with National Forest administration so that the Interior Department could make use of available procedures to defeat such abuses.

The effective prevention and correction of abuses requires no basic change in the General Mining Laws. We believe that undue publicity given to certain abuses has distorted the outlook of many as to the operation of the mining laws. We believe, however, that suitable amendments can be made in the General Mining Laws which, with proper use of available procedures, will simplify enforcement and minimize bad faith attempts through pretended mining locations to serve objectives other than the discovery and development of minerals. We believe that this can be accomplished in a manner which will protect

the incentive and reward now inherent in the mining laws.

We approve Public Law 585 of August 13, 1954 (68 Stat. 708) which, by removing the bases of conflict between the General Mining Laws and the Mineral Leasing Act, opened to mining location millions of acres and permits more complete utilization of the mineral resource of the public domain—this, by making possible the co-existence of an unpatented mining claim and a Leasing Act permit or lease and concurrent exploratory and production operations.

We commend the Secretary and Department of the Interior for their efforts and accomplishments looking toward simplification of land office procedures and expedition of applications for mineral patents; for evidencing in their administration of the mining laws a renewal of recognition that the mining laws express and foster private enterprise; and for their policy of reopening reserved public lands to legitimate private development and utilization.

In prospecting and exploratory work more reliance is being placed upon geological studies and new scientific methods and equipment for determining mineralization. It is widely believed that the mining laws do not encourage full utilization of these new approaches because they do not afford adequate protection to those who seek but have not yet made discoveries. We believe that careful consideration should be given to possible changes in the provisions of the General Mining Laws relating to "discovery" which would provide the necessary assurance to encourage the full use of these newly developing prospecting techniques—but this should be done without disturbing the basic principles of the claim location and patent system.

TARIFFS

We endorse the Government policy which recognizes that an adequate "mobilization base" of metal and mineral production for our national security is essential. To accomplish this our nation must look to its domestic production and ore reserves for the major portion of its mineral supply, despite progressive increase of imports of some metals and minerals.

Experience has shown that we cannot depend on foreign ore reserves as a source of supply in an emergency, however important it may be to import some metals and minerals to supplement domestic production and to fill our stockpile with materials in which we are deficient. World political conditions, as well as hazards of possible air and submarine warfare, support this conclusion.

We recommend, therefore, that Congress exercise its authority over tariffs to be administered for the welfare of the American people and provide reasonable tariff protection. In this connection we commend the U. S. Tariff Commission for its careful study and complete report to the Congress as well as its recommendations to the President on the industry's application for increased lead and zinc duties.

We commend the members of the U. S. Congress who worked tirelessly to secure the approval of the Tariff Commission's recommendation. It is regrettable that the President did not see fit to accept the Commission's recommendations. His alternative program, while having certain desirable features, is at best a stopgap solution and does not offer any real long-range cure to the problem of the domestic mining industry.

We favor the enactment of an excise tax on imports of lead and zinc, as well as other metals and minerals with similar problems, which may be suspended whenever prices are at an economic level that will permit the domestic mining industry to maintain an adequate "mobilization base" for national security.

Since the Executive Department of the Government has not seen fit over the past years to adhere to the purposes of the Escape Clause and Peril Point provisions of the Trade Agreements Act, we favor removing the authority of the Executive Department to act on the Tariff Commission's recommendations and favor the placing of such responsibility for approving or disapproving the recommendations in the hands of the Congress where the Constitutional authority rests. We also favor allowing the Trade Agreements Act of 1934, as extended, to expire on June 12, 1955.

The United Nations has established a Commission for International Commodity Trade. This Commission is empowered to recommend agreements to member countries such as those provided in Chapter VI of the Havana Charter, which was rejected by the Congress of the United States. We commend the State Department for its vigorous opposition to the formation and constitution of this new United Nations Commission. The powers of this Commission are far greater than those of the now disbanded International Materials Conference, which we strongly opposed. We have not changed our position with respect to International Commodity agreements, and, accordingly, we oppose any United States participation in this new

United Nations Commission, or in any new international commodity agreements which may be sponsored by the Organization of American states.

National security requires a healthy domestic mining industry with ample productive capacity and experienced working forces. Our greatest protection is industrial strength. We recommend maintenance of the fullest possible capacity for production of strategic and critical metals and minerals within the United States.

STOCKPILING

We endorse a national policy of stockpiling of strategic and critical materials and the provision of adequate funds at all times for orderly purchases for possible emergency needs. As long as the security of the Free World is threatened, the nation's stockpiles must be filled.

We believe the most efficient and economical procedure is to stockpile at times like the present when output exceeds demand and that it is in the national interest to reduce or suspend stockpile purchases during periods when shortage of metals causes dislocation of production in defense and essential industries.

In connection with minerals in which we normally are not self-sufficient, such as mercury, manganese, tungsten, chrome, nickel, cobalt, etc., a definitely stated long-term objective should be fixed and adequate domestic price paid to encourage the development of domestic reserves and the expansion of domestic production.

We recommend that no withdrawals from stockpiles be authorized except in a declared emergency when national security clearly requires release of a particular material. All metals and minerals acquired pursuant to the provisions of the Defense Production Act and the Agricultural Trade Development Assistance Act should be transferred promptly to the national stockpile, and should be subject to withdrawal only under conditions of a declared emergency.

We oppose the purchase of foreign metals and minerals for stockpile when adequate domestic supplies are available.

We believe continued operation of prospectors and small mining concerns is important because these smaller operations provide a pool of specialized knowledge and trained manpower available for the expansion of minerals production in the event of an emergency. Their activities also are the source of new mine discoveries of consequence.

LABOR RELATIONS

The Administration's long awaited recommendations for changes in the Taft-Hartley Act have confirmed our fear that the appeasement of labor leaders is still an important factor in the formulation of national labor policy. We believe that such a political expedient has no proper place in the field of labor legislation. Likewise we believe that a compromise approach of "something for everyone" in the matter of labor-management relations is neither conducive to constructive results nor consistent with the straightforward position taken by the Administration on other issues of great national concern.

The fight to maintain and strengthen the basic principles of the Taft-Hartley Act still requires constant vigilance and affirmative action. We reiterate our convictions that compulsory unionism and labor monopoly are incompatible with the principles of individual liberty and a free economy, that Communism in labor unions constitutes a grave threat to our national security, that democracy in unions and the rights of individual workers must be affirmatively guaranteed, and that recognition of states' rights is essential to the continuation of our system of federated government.

We again urge that the Taft-Hartley Act be amended to:

1. Prohibit compulsory unionism in any form.
2. Prohibit labor monopolies and industry-wide bargaining.
3. Require the President, in threatened national emergency strike or lockout situations, to utilize the provisions of the Act.
4. Safeguard the functions of management from union encroachment by eliminating compulsory bargaining.
5. Protect the rights of workers by requiring strike votes.
6. Effectively outlaw mass picketing, violence, intimidation and similar terroristic devices in labor disputes.
7. Restore stability to labor agreements.
8. Preserve to the states their right to regulate strikes and picketing; and
9. Effectively protect freedom of speech.

We again state our vigorous opposition to any of the following suggestions for amending the Act:

1. To permit further extensions of the principle of compulsory unionism under governmental sanction.
2. To outlaw State laws regulating or prohibiting compulsory unionism.

3. To eliminate any safeguard against communism in unions.
4. To permit replaced economic strikers to vote in representation elections.
5. To relax the prohibitions and procedures against secondary boycotts.
6. To qualify the exemption of supervisors.
7. To reduce union responsibility.
8. To relax limitations on the check-off.
9. To permit unilateral administration of welfare funds by unions; and
10. To eliminate the penalties for striking during the prescribed cooling-off period.

The Administration's advocacy of *free* collective bargaining points up the urgent necessity for removing the federal government from the bargaining table. Administrative and judicial interpretations of the statutory obligation to bargain have tended to reduce collective bargaining agreements to the status of involuntary codes imposed upon management by union-government dictation. The resulting inroads on the fundamental prerogatives of private ownership lead inevitably down the path to labor socialism. We strongly recommend the restoration of *free* collective bargaining by the elimination of governmental compulsion.

Those who seek to destroy our national institutions and to supplant them with socialism are as determined in their subversive efforts as are the forces of Communism. To obtain their objective they seek political ascendancy through domination of the working force. National legislation in the field of labor-management relations must be conceived in recognition of this aim and designed to thwart its attainment. We are wholeheartedly committed to the establishment and maintenance of such a bulwark.

GOLD AND MONETARY POLICY

Opposition of the Treasury to any positive steps toward restoration of the gold standard is disappointing. Deficits are still met by the deceivingly easy devices of a managed currency, with monetization of debt and depreciation of the dollar.

A first move to correct the existing situation is the removal of the prohibition on possession of gold and restoration to American citizens of full rights to hold, buy or sell gold. This could and should be done without delay. Until the right to convert dollars freely into gold is restored, our people will be denied the valuable protection against inflation that ownership of gold alone can afford, and our economy will still be plagued with uncertainties regarding the future worth of the nation's currency.

We again urge that gold and the dollar be made freely interchangeable at a fixed ratio determined by the relation between the dollar at its present stage of depreciation and the more persistent value of gold. The dangers of deflation through restoration of the gold standard with the dollar overvalued in gold, or of inflation through establishing convertibility with the dollar defined by too high a price in gold must both be recognized; and the importance of determining a ratio—or a price of gold—which would avoid either of these evils must be emphasized.

In accordance with these views, therefore, we again recommend:

(1) That the restrictions on the purchase, sale and ownership of gold by American citizens be immediately removed;

(2) That the gold standard be restored at the earliest practicable time;

(3) That Congress fix the ratio at which the dollar and gold are to be made fully convertible and determine other technical procedures involved in the restoration of the gold standard, after receiving the recommendation of a Commission of its creation, to which men skilled in appraisal of the world's potential gold supplies as well as men of competence in domestic and international finance and trade should be appointed by designated Government authorities.

The first of these steps should be taken immediately. While the other two are under consideration, the Treasury should cease its sales of gold to the so-called domestic industrial market, and thereby terminate the present enforced and unfair subsidy to industrial consumers at the expense of the gold miners.

SILVER POLICY

We endorse the existing Federal policy with regard to the acquisition of silver for its beneficial influence upon the base-metal mining industry, as well as for its traditional service in providing a base for a portion of the nation's currency.

GEOLOGICAL SURVEY—BUREAU OF MINES—BUREAU OF LAND MANAGEMENT

Three bureaus of the Department of the Interior are deeply concerned with public lands, mines and minerals—The Geological Survey, The Bureau of Mines and the Bureau of Land Management. The work of these agencies is of the greatest importance to the mining industry.

The organization of these three bureaus and their policies have just been thoroughly reviewed by committees selected by the Secretary of the Interior and composed of business and professional men in private life as well as some Department

representatives. We commend the Secretary for these organizational surveys.

We urge that adequate funds be appropriated for these three bureaus to the end that their work may be carried on effectively.

We again emphasize the vital importance of topographic and geological mapping to the mining industry and to national defense, and we continue to urge reasonable expansion of the mapping program.

We urge the transfer as rapidly as feasible to the Bureau of Mines and the Geological Survey of functions affecting mineral resources which have been scattered among various other departments and agencies, thus collecting such functions in the two bureaus best qualified to administer them.

MINE SAFETY

We reiterate our previous position that the safety of men working in mining operations is a primary responsibility of the mine operator and a matter for state regulation. We heartily commend the United States Bureau of Mines for its service to the mining industry in developing and disseminating improved techniques in mine safety. This work deserves adequate financial support.

URANIUM

The AEC should be highly commended for its pioneering and encouragement in the production of uranium ores from deposits in the United States, thereby enhancing our nation's security.

However, production of uranium concentrates is being retarded at present by lack of adequate milling capacity. Investment in these needed facilities and maximum deliveries of concentrate will be attained if the basic practices of free enterprise are followed to the fullest extent possible without jeopardizing the national security.

MINE FINANCING

We recommend that Congress reconsider the whole question of Securities and Exchange laws, rules and regulations, to the end that the desirable objectives of the present law be maintained and that obstructive or unnecessary features be corrected by appropriate amendment or repeal.

We recommend that the Small Business Administration liberalize its qualifications for granting loans for worthy mining enterprizes, and that the loan activities of the Defense Minerals Exploration Administration for defense metals and minerals be continued and adequately financed.

WATER AND AIR POLLUTION

Problems having to do with water and air pollution, in their very nature, are local not national in scope. Because of a knowledge and understanding of local conditions the solution of pollution problems can best be achieved by the cooperative effort of all concerned. Where local conditions require the solution of pollution problems that affect two States, the appropriate end may be achieved by interstate compacts.

GOVERNMENT REORGANIZATION

Under broad powers authorized by Congress, the Commission on Organization of the Executive Branch of the Government, the second Hoover Commission, is proceeding diligently with its studies of that branch's multitudinous agencies. Under outstanding leadership, the Commission is concerned with elimination of competing and overlapping responsibilities and with economy and efficiency in administration.

We again pledge our cooperation in all studies and inquiries of the Commission relating directly or indirectly to agencies concerned with mining and related industries.

Convention Huge Success

(Continued from page 62)

formance of Lucia di Lammermoor at San Francisco's beautiful Civic Memorial Opera House.

Las Vegas in 1955

The Mining Show of 1954 is history now. San Francisco and the San Franciscans went all out to help make it the greatest one in history. The entire mining industry registers a vote of thanks to Donald H. McLaughlin as chairman of AMC's Westtern Division, to Worthen Bradley as co-chairman and Granville S. Borden and Albert F. Knorp as vice-chairmen of the General Committee, as well as to other previously mentioned chairmen and their committee members who turned in such a sterling performance.

All eyes are now turned to the next convention which will be held in Las Vegas, Nev., the week of October 9, 1955. Even that fabulous entertainment spot will have to extend itself to match the high mark set by previous meetings. However, under the leadership of the new Western Division Chairman Roy A. Hardy, Nevada and Las Vegas will undoubtedly do themselves proud.

Those who attended the sessions in San Francisco heard all the important problems confronting the industry aired. All aspects of each question were heard and the consensus of the industry's views was set forth in unequivocal language. The discussions of operating problems and new methods and equipment were of the highest practical value to metal and nonmetallic mining men.

The coming year will bring its new problems and mining men will come to Las Vegas next year from all parts of the country to thrash out the answers. Plan now to be there.

Meeting rooms were crowded to capacity

Report on Convention Sessions

Overflow Audiences Participated in the Discussions of Industry's Problems. The Following Pages Give a Full Report of the Various Convention Sessions and Special Conferences. It Is Impossible, Within the Limits of a Single Issue, to Present Even an Abstract of Each of the Addresses by the 155 Speakers who Took Part in the Program. It is Planned to Publish Many of These Papers During the Months Ahead to Bring This Wealth of Valuable Information to the JOURNAL'S Wide Circle of Readers.

LABOR

SPEAKING at the Labor Session on Monday afternoon, presided over by Roy H. Glover, vice-president and general counsel, Anaconda Copper Mining Co., Rep. Wingate H. Lucas proposed changes in the Taft-Hartley Act which would remove the jurisdiction of the Federal Government over all activities traditionally within the power of the states and territories. He also proposed a national right-to-work amendment to the law and advocated a ban on industry-wide bargaining.

The Communist Control Act of 1954 was discussed by Denison Kitchel, attorney and chairman of the AMC Resolutions Subcommittee on Labor Relations. The act, he said, "represented the attainment by the mining industry of a legislative objective which has long been considered of paramount importance." Reviewing the provisions of the act and the penalties on Communist-infiltrated unions he went on to say, "No union free from Communist control has anything to fear, but this law may provide the means for liberating from such control thousands of union members who are loyal Americans unwittingly caught in a net of Communist intrigue."

Edwin R. Henry, Employe Relations Department, Standard Oil Co. of New Jersey, traced his company's approach to the problem of selecting supervisors. He said that the main source of supervisors within the company is from employes below the supervisory ranks. This means that these positions are filled by individuals with long service records with the company. He concluded that the program adopted by any company should be one which the supervisors themselves should build and carry out for the purpose of selecting their successors.

A "grass roots" public relations program on the part of mining companies was advocated by Miles P. Romney, manager, Utah Mining Association, who also described the educational work being done in Utah by his organization. Romney expressed the opinion that an effective public relations program directed at the "grass roots" level would simplify many of the problems of the mining industry. The objective, he said, is "to obtain a better understanding of the problems and principles affecting the mining business among our neighbors. These are the people in the

areas where we operate; the business men up and down the streets of mining communities, the city, county and state government officials; students in our schools, and our own employes and stockholders. If these people fail to understand the conditions which create a good or a bad operating environment when they live next door to us, how can we hope to be given proper consideration on the broader national-level?" A good start, Romney said, would be for the mining companies to look for opportunities to create understanding of mining principles among their employes, stockholders and suppliers.

M. P. O'Brien, dean, College of Engineering, University of California, discussed ways and means of encouraging students to enter mining. He stated that the most effective way to encourage young men to enter any particular industry is to hold out to them the prospect of substantial financial rewards and of work that will tax their ability to the limit. The opportunities available in mining, he said, must be brought to the attention of students if they are to make an intelligent choice, and much more needs to be done in the way of publicizing both the opportunities and the rewards open to mining engineers.

PUBLIC LANDS

CHAIRMAN A. L. Miller of the House Interior and Insular Affairs Committee, served as chairman of the Public Lands Panel discussion. He congratulated the American Mining Congress for its support of Public Law 585 and said that "while there has been some unjust and undesired publicity charging the mining industry as a whole with using mining claims for other than mining purposes, I believe the Mining Congress has done a good job in letting the public know that the industry does not condone abuses of the laws, and has stood ready to assist the Government in eliminating such abuses which reflect adversely upon the mining industry."

Reorganization of the Bureau of Land Management was described by Orme Lewis, Assistant Secretary of the Interior. He said the main purpose of this reorganization was to do away with centralization. "What this really means is that your state supervisor in each of the Western States is the head of the Bureau of Land Management as far as that area is concerned," Lewis stated, "and I mean just exactly that." He pointed out that unless a regular appeal was made, each state supervisor will have final authority upon all Bureau of Land Management matters throughout his area of jurisdiction.

Legislation introduced during the 83rd Congress which proposed revisions of the mining laws was discussed by Raymond B. Holbrook, chairman of the AMC Public Lands Committee. He pointed out that the conflicting interests of the mining and oil and gas industries over operations on the public domain were resolved by enactment of Public Law 585 and expressed the hope that the mining industry may resolve its differences with other users of public lands in the same manner. Enactment of the D'Ewart-Dworshak bill, he said, would eliminate most of the incentive to misuse the mining laws.

Edward C. Crafts, assistant chief, Forest Service, U. S. Department of Agriculture, stated that his department believes legislative action is needed to provide that: mining claims go to patent within a reasonable period after location; notice of location be recorded in the nearest District Land Office, with the same information that is presently supplied to the county recorder; and that title to all timber be retained by the United States except for the timber required in mining operations.

Representative Clair Engle of California briefly discussed a measure which he sponsored and which was passed by the House of Representatives during the 83rd Congress, providing that mining locations may be made, at the risk of the locator, on lands presently withdrawn for power site development. Engle also expressed the opinion that there is a disposition within some parts of the mining industry to merely defend the Mining Law of 1872 rather than to take the initiative and try to formulate affirmative programs to solve the problems of multiple use of the public domain, without disturbing the basic legal position of the American prospector and miner.

The recordation of mining claims in the District Land Office of the Bureau of Land Management was suggested as a partial solution of the problem of administering the Public Land Laws by Rep. John J. Rhodes of Arizona. He further suggested that the affidavit, required of mining claimants with respect to performance of annual assessment work, might also include a description of the actual improvements to the property.

State Senator Edward J. Regan of California revealed that the land owned by the Federal Government in California has increased from 38 percent to 48 percent of the total state area during the past 15 years. He suggested that effective legislation be enacted to provide for the return of public lands, not vitally needed for Federal purposes, for the use of local government and for the expanding economy of the states.

A proposal to modify present discovery requirements, to permit and encourage the use of modern prospecting techniques, was made by C. J. Parkinson, attorney, Salt Lake City. In order to justify the large expenditures required to effectively carry out geological, geophysical, and geochemical prospecting, he said, legislation is needed to insure necessary property rights in the selected lands and enable the prospector to enjoy the rewards incident to discovery. He pointed out that our present mining laws are not adequate to encourage the full use of modern prospecting techniques.

Edward Woozley, director, Bureau of Land Management, gave assurance that the Bureau is making public lands available for private acquisition as rapidly as possible if they can be properly classified for such disposal. He stated that withdrawn lands are being restored to the public domain as rapidly as it can be determined whether such lands are actually needed by the Government department that originally requested their withdrawal. Woozley also pointed out that the U. S. mining laws and mineral leasing laws have demonstrated their effectiveness in encouraging private enterprise to explore, develop and produce the minerals needed for our ever-expanding peacetime economy and to help satisfy stockpile requirements for national defense.

Stephen L. R. McNichols, general counsel, Uranium Ore Producers Association; William G. Waldeck, attorney, Montrose, Colo., and Clair M. Senior, attorney, Salt Lake City, explained in detail the various provisions of Public Law 585 and pointed out the significance of the new law to the mining industry. In essence they agreed that the new law reconciles the technically incompatible features of the mineral leasing law with the general mining law and thus will help in achieving maximum economic utilization of our land resources. They pointed out that Public Law 585 has opened to mining location 60,000,000 acres of lands previously withdrawn for the development of oil and gas, and also that mining claims may now be validly located on the basis of discoveries of fissionable materials.

COMMUNISM

PRIOR to the stockpiling and tariff session Tuesday afternoon, the late Senator Pat McCarran of Nevada described the Communist Control Act of 1954 and expressed the opinion that organized labor as well as the internal security of the United States will be well served by its enactment. He said the most important effect of the new law is that it will provide a real incentive for Communist-infiltrated or Communist-dominated unions

to purge themselves of such Communist influence. McCarran asserted that this measure is actually a pro-labor law and predicted that after it has been in operation for a reasonable period it will have the strong support of organized labor. He reviewed the part he played in drafting the new law and securing its enactment, and stated that he felt his activities in that regard were among the greater services he had performed for organized labor during his lifetime.

STOCKPILING AND TARIFF

THE stockpiling and tariff panel was chairmaned by Endicott R. Lovell, president, Calumet & Hecla, Inc., who expressed the gratitude of the mining industry to Senator McCarran for all that he had accomplished in fighting the Communist movement within the United States.

Senator George W. Malone of Nevada declared that an economic approach to destroy this nation had its base and inception in the Trade Agreements Act first passed by Congress in 1934. He made the point that it is only necessary to allow this Act to expire next June in order "to revert to the Constitution of the United States in the regulation of foreign trade through the adjustments of the duties or tariffs by the United States Tariff Commission—an agent of Congress." In conclusion he advocated the adoption of an American policy "based upon the ultimate security and well-being of the people of the United States of America."

The responsibility of the Office of Defense Mobilization in acquiring defense materials was described by C. H. Weaver, Assistant Director for Materials, ODM. He stated that ODM is attempting to develop industrial expansion programs and secure adequate stockpile inventories of critical materials in the shortest period of time without interfering with the defense program, and without creating undue hardship within the civilian economy. ODM, he said, will continue to work closely with the Department of Interior to insure that wartime mobilization plans give adequate recognition to the importance of maintaining a strong and healthy domestic mineral industry.

Representative Thomas E. Martin of Iowa told the convention that the Economic and Social Council of the United Nations has voted to establish a Trade Stabilization Commission which will have all of the powers of the International Materials Conference and many of the powers contained in the Havana charter for the International Trade Organization, which was rejected by the Congress of the United States. He pointed out that the United States voted against the establishment of this new United Nations Commission, which was sponsored by several of the so-called underdeveloped countries and then pushed through by the Communist bloc, including Soviet Russia and Czechoslovakia. "The job before us is to preserve a going-concern mining industry in the country to build up an adequate stockpile," he concluded, "and then to do everything we can to further industrial development through free private enterprise, both here and abroad."

Under the Constitution the establishment and modification of tariff rates was made the responsibility of the legislative branch of the Government, rather than of the executive, asserted O. R. Strackbein, Chairman, Nationwide Committee of Industry, Agriculture and Labor on Import-Export Policy. He pointed out, however, that executive control of tariffs and trade is much better suited to international planning and to the subordination of the domestic economy to the considerations of international relations. "That is why the global trade planners and those who seek to subordinate domestic economy to consideration of foreign affairs," he continued, "strenuously oppose the recapture by Congress of its constitutional authority to regulate our foreign commerce." He called for the expiration of the Trade Agreement Act next June and the withholding of policy-making decisions on powers of review from GATT or any other international trade organization to which the U. S. might, with Congressional ratification, choose to adhere in the future.

Jean Vuillequez, vice-president and Director of Sales, American Metal Co., Ltd., stated that the United States in the foreseeable future cannot produce enough lead and zinc at home to serve our processing and manufacturing industries. He pointed out that most smelters in the U. S. depend upon the importation of foreign ores and concentrates for their operations and stated that the position of his company is "that there should be no tariffs upon imports of any raw materials for which we are substantially dependent upon friendly foreign sources of supply."

Every session had its quota of standees

TAXATION

UNDER the Chairmanship of Representative Thomas E. Martin of Iowa industry and government officials highlighted some of the provisions of the Internal Revenue Code of 1954 as they affect the mining industry. The discussion centered around improvements that have been made in the tax laws by the new Code and those still needed in future legislation.

Chairman Martin, in setting the stage for the morning discussion, declared "To talk solely of taxes is idle. Tax policies are based upon the Budget, and budget problems rest upon the policies adopted to meet the problems confronting us."

Senator Wallace F. Bennett of Utah, spoke of some of the changes in the new Code designed to encourage and strengthen the mining industry, such as broadening the depletion provisions, liberalization of depreciation and an increase in the amount allowable for exploration write-offs.

Representative Hale Boggs of Louisiana spoke of what the future holds taxwise and pointed out . . . "that despite the continuing attacks on the concept of percentage depletion, it will remain in our law, and that as the people come to understand what it means to our entire economy, these attacks will gradually cease."

Frank M. Harless of the Internal Revenue Service told the audience of some of the problems that our Nation's tax collectors are facing and how they expect to meet them in the mammoth job of administering the new Code.

AMC Tax Committee Chairman H.. B. Fernald expressed the thanks of the mining industry for the outstanding job that Congress has done

in bringing forth the 1954 Internal Revenue Code. He noted that the new Code is not perfect and that it contains unintended errors and conflicts which must be corrected by supplemental legislation.

Ellsworth C. Alvord, AMC tax counsel summarized the morning discussions, declaring that much has been accomplished but that a big job lies ahead for Congress and those administering our tax laws to make the new Code accomplish the intended results.

GOLD, SILVER & MONETARY POLICY

DONALD H. McLAUGHLIN, president, Homestake Mining Company, and chairman of this important session; Representative Clair Engle of California; Barret Griffith, director, Golden Cycle Corporation, and Ernest R. Gutmann, economist, spoke of the many problems facing the gold mining industry and outlined a program for solving them.

Congressman Engle suggested approaching the problem one step at a time, the first being to ask for a free market in gold and to allow American citizens to possess and deal in gold. Engle pointed out that there is a disposition among people with reference to legislation to "try and wrap it all up in a nice big package and put a blue ribbon around it." He declared that you just don't do it that way in our kind of government.

Mr. Griffith warned, "the United States should stop its purposeful and fatal monetary inflation by returning to the gold standard, and do it promptly." He declared that even a brief look at monetary economics leads to the conclusion that inflation will continue until Americans force their political leaders to stop it.

Dr. Gutmann stated that an adjustment of the monetary unit is the only way to stabilize, without starting a serious depression. He also urged a redefining of the monetary unit in keeping with the price structure before we go back to the gold standard.

Chairman McLaughlin pointed out that the London gold market was opened on March 22 of this year. He declared that it is high time we had a law that would at least remove the restrictions on the ownership of gold by the American people.

There were many exploratory drills on display indoors and out

OUTLOOK FOR MINERALS

AT a session Thursday morning dealing with the Outlook for the Mineral Industries, Chairman Frank R. Milliken, vice-president, Kennecott Copper Corp. said that the mining industry should be concerned as to what effect Government policies, new operating developments, and improvements in techniques will have on the future business outlook for the industry.

Discussing the outlook for the nonferrous metals, Simon D. Strauss vice-president, American Smelting & Refining Co., said that copper, lead and zinc have not been included in the increase in general business activity to the extent they should. He stated that if the base metals are to enjoy their normal share of an expanding market, "the producers of these metals must be prepared to offer their wares at an economic price in relation to competitive materials, and the fabricators and manfacturers who will convert the metals into finished products must have reasonable assurance of future supplies comparable with the assurance they now feel about aluminum." He concluded that the base-metal industry can win friends and increase demand by calling attention to the proven merit of its product and by concentrating on finding ways to make the production and use of copper, lead and zinc easier and cheaper.

R. T. Elstad, president, Oliver Iron Mining Division, United States Steel Corp., in reviewing recent developments in the production of iron ores, stated that the past 12 months have been the most significant period in the history of the industry with regard to the development of new iron ore sources. He said that despite the challenge of other metals and plastics, iron and steel will continue indefinitely to be the backbone of our Nation's economy and industrial future and pointed out that ore reserves will be ample for future requirements.

Lawrence Litchfield, Jr., general manager, Mining Division, Aluminum Company of America, told his audience that the history of aluminum during the past 50 years is a record of an endeavor to produce the "perfect metal," and other light metals, such as magnesium, are following the same path. He concluded that expansion programs of the producers of light metals will continue to make headlines in the future and that aluminum and magnesium make up one of the most dynamic and promising segments of the metals industries today.

A paper on the outlook for nonmetallic minerals was presented by Richard J. Lund, manager, Information and Analysis Department, Battelle Memorial Institute. Except for excess domestic capacity posing a

modest threat to potash, rare earths and perlite, and excessive imports troubling fluorspar, potash and the rare earths, Lund stated that both the short and long-term outlooks are favorable for a continued high rate of production in the field of nonmetallics.

Charles H. Segerstrom, Jr., president, Nevada-Massachusetts Co., discussing strategic minerals, stated that the Government is a partner with the producer of strategics and will remain so as long as the stockpiling of these metals and minerals continues. Segerstrom said the outlook for these minerals at present is encouraging and will continue favorable as long as the present procurement programs are in effect. He pointed out, however, that the outlook after the present programs and goals are attained is of concern to every domestic producer.

In presenting the outlook for Canadian mining prosperity, Marc Boyer, deputy minister, Department of Mines and Technical Surveys of Canada, stated that progress during the past decade has built the foundation for very rapid future expansion. He revealed that recent discoveries in many areas have made Canada immensely richer mineral-wise than anyone dared to believe a few years ago. Canada now has the mineral resources, he concluded, which can make her a great nation, if Canadians will accept the challenge.

George O. Argall, Jr., Editor, *Mining World*, reviewed the outlook in the production of foreign minerals. He observed that foreign production must follow the general pattern of mineral production and consumption set in the United States. The high metal prices during the Korean War, he said, resulted in overproduction of many metals on a world-wide basis. This overproduction will continue, he stated, only as long as the United States continues its stockpile procurement. He cautioned that Russia is in a position to undersell any mining company in the world. The USSR does not operate on a profit and loss basis, and will sell at below-cost prices if such action will put a free-world mine out of business.

URANIUM EXPLORATION AND DEVELOPMENT

ON Tuesday afternoon, Gloyd M. Wiles, manager, Mining Department, National Lead Co., was chairman of the session on uranium exploration and development on the Colorado Plateau.

Elmer V. Reinhardt, Hunt Oil Co., presented a paper based on the hypothesis that the uranium deposits of the Colorado Plateau area were not formed simultaneously with the rocks in which they occur. He held that primary controls of the Plateau deposits are structural, whereas sedimentary controls are secondary. He pointed out as significant that the ore, regardless in which sedimentary horizon it is found, is always in a permeable bed about 200 ft below an impervious layer and went on to explain how, in his opinion the deposits were formed.

Convention visitors were grateful for a quiet place to rest

Robert J. Wright, chief, Geologic Branch, Exploration Division, U. S. Atomic Energy Commission, he discussed the role of rock types in localizing uranium deposits in the sandstones of the Colorado Plateau. He answered the questions, "Does uranium favor a particular type of rock? If so, what are the features of this rock and how closely are the deposits controlled by it? Finally, what are the implications of the origin of the ore?"

In doing so he made five points: first, that all known host rocks were stream deposited; second, they may be any color but red; third, they all contain carbonized fossil wood; fourth, they are all micaceous or arkosic, and fifth, sandstone units which interfinger, or are interbedded with mudstone, are favorable for ore. In conclusion he pointed out that the above conditions are not limited to the Colorado Plateau but could include all the Tertiary basins in the Western States.

Leaving the problem of how the uranium deposits were formed and in what rocks they are most likely to be found, Royal S. Foote, chief, Geophysical Exploration Branch, U. S. Division of Raw Materials, U. S. Atomic Energy Commission presented a paper on airborne prospecting for uranium. Observing that the prospector who walks the hills and finds the ore is still the most effective means of exploration, he went on to describe the airborne methods of radiometric surveying developed in the last few years. In his description he included analyses of the relative cost, speed and effectiveness of the several methods.

Walt Bilicke, president, Engineers Syndicate, Ltd. in discussing Mr. Foote's paper elaborated on some of his statements. He pointed out that it is the responsibility of the instrument manufacturers to develop multi-purpose instruments, where possible, and indicate which instruments available should be used for fast reconnaissance work and which for pinpointing areas that may hold commercial possibilities.

Progressing from the finding of radioactive mineral deposits to the calculation of whether the deposits so found are commercial calls for another kind of information. Henry R. Wardwell, mining geologist, Exploration Division, Ore Reserve Branch, USAEC, took on the task of supplying valuable information on that score. He pointed out that the classification and calculation of uranium ore reserves in the Colorado Plateau area has been an important part of the Atomic Energy Commission's work over the last few years. He outlined what the Commission had done in these respects and told how they arrived at figures for ore reserves. He did not claim that the Commission could forecast just how much could be realized on any deposit but did say they felt reasonably sure

This front-end loader showed remarkable pickup

of how much U_3O_8 there might be in any given deposit.

A. L. Bush and H. K. Stager, geologists, U. S. Geological Survey, outlined the Survey's methods for estimating uranium-vanadium reserves in Plateau type deposits. They pointed out that such estimations are always subject to considerable error but that on the whole the error has been in the order of 25 percent.

The rest of the session was given over to technical discussion from the floor of the relative values of several different kinds of detectors—and their limitations.

URANIUM MINING AND METALLURGY

THE mining and metallurgy of uranium was covered in Wednesday morning's session. Marvin L. Kay, vice-president and general manager, Climax Uranium Co., Grand Junction, Colo., presided.

Dan M. Kentro, metallurgical advisor, Division of Raw Materials, U. S. Atomic Energy Commission, outlined some of the methods used in processing uranium ores, particularly those originating in the Colorado Plateau area. He explained that processing of uranium ores to produce a marketable uranium concentrate is at present based on hydro-metallurgical methods, with physical concentration methods playing a minor role. Because uranium ore processing is a relatively new art, the arguments as to which is the best way to do the job are, perhaps, more varied than is the case with other metals. In the next few years, as new plants, with processes different from those now used, are built and operated, most of the arguments will be settled by the results that prevail, Mr. Kentro concluded by saying that, although some of the new processes were developed and encouraged by the Commission, as the uranium mining industry takes them over, it will improve them considerably.

Woodrow Knott, Climax Uranium Co., pointed out that Climax treats ores coming from 50 to 75 different sources—as do most of the other uranium processing plants in the Colorado Plateau area. Because of this, most of the plants are in more or less a continuous state of change in an attempt to keep up with the varying mill feed.

C. E. Osborn, manager of operations, Navajo Uranium Division, Kerr-McGee Oil Industries, Inc., described the flow sheet of his company's uranium ore concentrator now under construction at Shiprock, N. Mex. This plant will make use of an all-acid process for concentrating carnotite and roscoelite types of ore. It will produce both uranium and vanadium oxide.

R. C. Cole, plant manager, Vitro Uranium Co., described the operation of Vitro's Salt Lake City plant. Purchased by Vitro in 1950, the plant was built during World War II for the production of alumina from Utah clays, and has been converted to process the uranium ores that come principally from Marysvale, the San Rafael Swell, and Temple Mountain areas.

Fred A. Brinker, chief metallurgist, Vanadium Corp. of America, spoke on milling Monument Ore at VCA's Durango Plant. He noted that the mill at Durango makes three products, namely, red cake, vanadium oxide and yellow cake.

After an active floor discussion of uranium milling, R. G. Sullivan, vice-president and general manager, Minerals Engineering Co., spoke on drilling techniques on the Colorado Plateau. He pointed out that drilling remains the major tool for exploring the flat-lying formations of the Colorado Plateau. Today, in four states, Colorado, Utah, Arizona and New Mexico, there are an estimated 250 drills occupied full time in uranium exploration. Many other drill units, transferred temporarily from the oil exploration fields, are also used and they raise this number to well over 300 at times. Mr. Sullivan then went on to describe the strength or weakness of each type of drill now being used in the Plateau area. New developments in each category were discussed and the range of present contract prices was given.

Matthew P. Rowe, partner, La Salle Mining Co., Grand Junction, Colo., spoke on mining and development of the La Salle ore body. He began by outlining some of the practices peculiar to uranium mining and the reasons for them. Small-sized deposits and the short life of many properties prohibits spending much money on mechanical installations at many uranium mines. Often economics demand cheap development and small capital investment. Rowe then described the development of the Club Mesa Mine of the La Salle Mining Co.

AEC PROGRAMS

THE Wednesday afternoon session dealing with Uranium Industry and AEC Programs on the Colorado Plateau attracted the largest crowd of the convention. Chairman for the session, attended by well over 800 delegates, was T. O. Evans, chief mining engineer, Atchison, Topeka and Santa Fe Railway Co.

With the use of colored slides, Merrick K. Ruddock, vice-president, Cal Uranium Co., Moab, described the big Indian Valley in eastern Utah. He stated this may prove to be the richest uranium mining district in the United States. In spite of the many problems that still exist within the area, he concluded that the development of Big Indian uranium reserves has been due to a fruitful joint effort by private industry and Government.

Jesse C. Johnson, Division of Raw Materials, U. S. Atomic Energy Commission, discussed the outlook for the uranium mining industry in the years ahead. He revealed that the United States has become one of the world's leading uranium producers and pointed out that this was accomplished in a period of six years — starting with nothing but uncertain prospects. It is now a $100,000,000 industry.

He stated that the United States must maintain a very high discovery rate of new orebodies if this high production is to be maintained. He cautioned that the present ore reserves would be largely exhausted by 1962 if prospecting and exploration were to stop now.

Johnson expressed the opinion that there may well be further extensions of the guaranteed market price for uranium under the defense program beyond the present termination date of March 31, 1962. As for the prospect for a commercial market, he stated that nuclear equipment is expected to be used for some of the new commercial electric power plants by 1965 or earlier. He projected future requirements for kilowatts of electrical capacity within the United States and estimated that the nuclear power industry will require 14,000 tons of uranium metal a year by 1975 or 1980. "There is no doubt about the future importance of this new industry," Johnson concluded, "only its time table is still uncertain."

Sheldon P. Wimpfen, manager, Grand Junction Operations Office, AEC, discussed the present status of domestic uranium production. Wimpfen revealed that production of uranium ore has doubled every 18 months since the beginning of the program and that surprising results are still expected in terms of the discovery and production of ores. He said that the AEC is presently engaged in a mill expansion program designed to increase by several fold the present capacity of existing facilities.

The problems of private industry's future in uranium exploration and development were discussed by G. R. Kennedy, manager, Uranium Exploration, Kerr-McGee Oil Industries. Kennedy posed several searching questions which he said must be answered by the Atomic Energy Commission if uranium producers are ever going to learn whether or not they are in a permanent business. He congratulated the Atomic Energy Commission on the outstanding job that has been done in bringing the domestic uranium program to its present healthy condition. He stated, however, that under competitive conditions, private industry

can do the job even better than it is being done now, if given the opportunity.

Charles A. Steen, president, Utex Exploration Co., said that it would be very helpful to those who have to provide housing in boom communities to have some assurance that uranium ore will be purchased by the Government after 1962. He expressed the belief that the production of uranium ores from the Big Indian mining district will continue for many years to come.

Robert S. Palmer, executive vice-president, Colorado Mining Association, stated that present-day activity in the uranium industry is due to many factors, including the exploration and development projects so far completed by private industry and governmental agencies and the long-term procurement program of the Atomic Energy Commission. He paid special tribute to the contribution made by small operators to the development of uranium production.

W. E. Haldane, past president of the Uranium Ore Producers Association, expressed the view that the AEC procurement program is still in need or readjustment and realignment to accord with practical experience gained by both the Government and private industry during the past five years. One of several suggestions made by Haldane was that the Government should withdraw from the exploration, development and production of uranium ore in the near future.

The question as to whether or not a firm price should be established for uranium concentrates on the Colorado Plateau was discussed by J. W. Hill, mining engineer, Grand Junction. He expressed the opinion that a reasonable fixed price would encourage the industry to increase its production of uranium ores and concentrates, and would result in a reduction of the program cost to the Government.

NEW URANIUM FIELDS

PHILLIP L. MERRITT, assistant director, Division of Raw Materials, AEC, was chairman of a session on new developments in uranium in North America.

Donald L. Everhart, geologic advisor, AEC, revealed that many new discoveries of uranium have been made outside the Colorado Plateau since the establishment of the commission's ore buying program in 1948. Important new developments have been claiming increased attention in many parts of the United States, including Wyoming, Eastern Colorado, North and South Dakota, New Mexico, Arizona, Nevada, California, Pennsylvania, New York, and New Jersey. He expressed the opinion that it will be many years before new discoveries of sizable ore deposits averaging 0.2 percent U_3O_8 or better in grade will cease, and that the time for dependency on lower grade ores appears to be far in the future.

Exposition halls were busy places all during the Show

Robert M. Garrels, U. S. Geological Survey, discussed the weathering of the "sandstone type" uranium deposits of the Colorado Plateau. Garrels said the present extremely complex mineral assemblages found in such deposits can be interpreted as the result of the reaction of an original, simple, low-valence mineral with the elements of the ore minerals and with the various materials of the host rock. The copper-uranium ores are apparently moderately water soluble and tend to be removed from the outcrop, disseminated, and lost, he explained, while on the other hand the vanadium-uranium ores are only slightly soluble and therefore persist for long periods of time.

A description of the uranium deposits in the basin ranges of Nevada and Southern California was presented by Ernest E. Thurlow, chief, Salt Lake Exploration Branch, AEC. He said there are many surface showings of uranium in the Basin Range and Sierra Nevada provinces, few of which have been thoroughly explored. The prospectors are doing a good job in finding new occurrences, he stated, but the real challenge is for mining interests to take up the job of exploration and development and to bring about the production of uranium from these new areas.

Development of uranium production in the Black Hills of South Dakota and Wyoming was discussed by Lincoln R. Page, U. S. Geological Survey, who used slides to describe the structural environment of the various districts within the area. Production so far has been small, he stated, although recent exploration indicates the presence of larger concealed deposits, some in excess of 20,000 tons, and at depths of at least 100 ft.

Eugene W. Grutt, chief, Douglas Office, AEC, also used slides to describe the Tertiary basin deposits of Wyoming. He said that at present, many thousands of uranium claims have been filed within the area and several hundred thousand acres of state-owned lands have been leased in the eastern two-thirds of Wyoming. This has resulted in a degree of mining activity never before seen in the State. In conclusion, he pointed out that outside of the Colorado Plateau, there is probably no other region in the United States that contains such widespread occurrences of uranium as those that exist in Wyoming.

In describing the uranium deposits in the Algoma District of Ontario, Franc. R. Joubin, managing director, Technical Mine Consultants, said that his remarks covered the results of approximately 15 months of intensive development. He stated that conglomerates were found in the area that not only contain uranium in important quantities but which are very large in size and occur under geological conditions that will allow for very rapid and inexpensive development. He expressed the belief that the district is well on its way to become one of major world-wide importance.

B. C. Macdonald, chief geologist, Eldorado Mining & Refining Ltd., described the ore deposits of the St. Louis fault, located in the Athabasca region. The best uranium mineralization, he said, has been found near strong structural features and particularly in the immediate zone of influence of faults. He revealed that all ore developed or indicated to date occurs within a few hundred feet of the fault, with the strongest zones lying adjacent to it. He said the mineralogy of the deposits is relatively simple, being an association of pitchblende, hematite, calcite, quartz, and chlorite.

NONMETALLIC MINERALS

ON Tuesday morning, Olaf P. Jenkins, Chief, California Division of Mines, presided over a session dealing with the broad range of problems in the industrial minerals field. Henry Mulryan, president, Sierra Talc and Clay Co., presented an introductory review of the field. He pointed out the many ways in which industrial minerals such as rock, sand, gravel, limestone, shale, gypsum, asbestos, talc, bentonite and barite help make possible the extremely complex civilization in which we live. He said that the soft spots in our economy will be found among the metal users and not among the users of nonmetallic minerals. He went on to predict that the industry would continue to increase in size and importance.

J. G. Miller, manager, Sales Development, Westvaco Chemical Division, Food Machinery & Chemical Corp., in outlining the many uses for phosphates said that these are truly chemicals of universal application. He outlined their use as fertilizers, as leavening agents in food products, as metal coating compounds and as water softening agents and detergents. In 1953 about 12,000,000 tons of phosphates were mined which had a value at railhead of $50,000,000 to $60,000,000.

Robert A. Kinzie, Jr., Superintendent, Santa Cruz Portland Cement Co., who spoke on the cement industry of the West Coast, traced the history of cement making since 1877 and pointed out that it has grown in proportion with the population. Except for two drops, in 1929 and 1935, the trend in the industry has been ever up. He said that although the trend in use of cement will continue upward increased plant capacity will keep pace.

Charles W. Chesterman, associate mining geologist, California Division of Mines, discussed the lightweight aggregates of the eleven western States. He pointed out that these materials which include perlite, expanded clay, shale, pumicite, pumice and vermiculite are, with the exception of the last, very widely distributed throughout these states. They are all in competition with sand and gravel and are therefore economic mainly when they occur in large, easily mineable deposits near their potential markets. As nearby sand and gravel deposits become exhausted the lightweight aggregates will find more and more use.

Edward L. Howard, physical testing engineer, Pacific Coast Aggregates Inc., traced the changes in desired specifications for aggregates over the years and reported that last year's production in California was about 53,000,000 tons, valued at $45,000,000.

He pointed out that California's production of all concrete making materials in 1952 was $122,986,665, or about ten times the dollar value of the State's gold production.

Fred Lohse, assistant to the vice-president, Kaiser Aluminum and Chemical Corp., spoke on the nonmetallic raw materials used by the chemical industry. He pointed out that industrialization in the West can be said to have begun with the great influx of population that began about 1930. He prophesied that, although still relatively small, the chemical industries of the West are going to experience an even greater expansion in the year ahead. Lohse also pointed out that as the chemical industry grows so will the demand for the nonmetallic minerals and coal, which are its raw materials.

Richard S. Lamar, research director, Sierra Talc & Clay Co., stated that, although a comparatively recent development, the use of talc in ceramics has, for some applications, become even more important than clay. California, he said, is a major source of the talc used in this country. Prior to 1930 very little talc, possibly one percent of domestic production, was used in ceramics. By 1951 the use had increased to 27 percent of production. He enumerated the many ways in which talc is used in ceramic products. The talc industry, Lamar prophesied, will continue to grow, much of the growth being due to its use in ceramics.

Lauren A. Wright, California Division of Mines, spoke about the geologic occurrence of talc. With the aid of slides he illustrated the types of rocks and the localities where it occurs in California.

G. A. Brashares, general sales manager, Harbison-Walker Refractories Co., described the use of olivine in the manufacture of refractories. Forsterite refractory brick, he said, are made from pure low iron olivine. He enumerated the properties which make these brick particularly suitable for use under high temperatures where they are subject to alkaline dusts and fumes. He also referred to the recently developed interest in the use of olivine as a substitute for silica sand in foundry molds and said that a number of service trials of the material are under way.

GEOLOGY AND EXPLORATION

WITH Rodgers Peale, consulting geologist of San Francisco in the chair, a session on Geology and Exploration was held Monday afternoon.

J. Eldon Gilbert, general manager of Cordero Mining Co., reported on the various methods of geophysical prospecting employed by Cordero. The company has had moderate success in prospecting for mercury, antimony, tungsten and chrome with the magnetometer and electrical resistance methods, but very limited success with the natural electrical potential method, chemical soil analysis or spectrographic analyses of pannings. Based on experience, he concluded that the good field man with a miner's pan, a pick, good transportation (which often still means a burro) can compete in the business of finding mines.

Konrad B. Krauskopf, Professor of Geochemistry, Stanford University, discussed the basic idea of geochemical prospecting, which is simple and logical. Rocks and soil adjacent to a hidden mineral deposit should contain traces of the metals in it which can serve as guides. Limited success to date with geochemical methods points to the necessity of further research before the potentialities and limitations of these methods can be fully established.

Dr. T. S. Lovering, United States Geological Survey, added to the paper by Mr. Krauskopf on geochemical prospecting. He pointed out that on the basis of statistics, the chances of finding deposits in areas already thoroughly covered by "the man with a pan" are not great. It is possible to interpret the results obtained either by geochemical or geophysical means, in the light of geological knowlege. If commercial results are found, all is well. If there is no commercial deposit, the attempt must be written off.

Robert E. Thurmond, mine superintendent of the Pima Mining Co., gave a progress report on the Pima Orebody. He described the orebody more completely than it has been hitherto and reviewed the exploration project that led to its development. As a result of the initial exploration work, it seemed that the Pima Orebody might be a small, high-grade ore deposit. Subsequent work has led to the belief that it is a medium large, low-grade property.

In the discussion that followed Mr. Thurmond's paper, Ira Joralemon, who was a consultant on the project, offered some interesting observations regarding the orebody and its host rocks.

A. E. Walker, geologist for the M. A. Hanna Co., presented a paper on the Riddle Nickel deposit. He described the exploration project which has led to the development of this interesting mine. This orebody will be producing 8,000,000 lb of contained nickel in ferronickel by the end of this year. Eventually this capacity will be doubled.

Salem J. Rice of the California Division of Mines, in discussing Mr. Walker's paper, pointed out that secondary nickel ores, as found at Riddle

and elsewhere, are merely specialized types of lateritic soils often derived from serpentines. Such deposits may also occur in California, he said, although there has not yet been enough work done to determine how valuable any known potential deposits in the State may be.

DRILLING AND BLASTING

AT the Drilling and Blasting Session, under the chairmanship of J. B. Haffner, president, Bunker Hill & Sullivan Mining & Concentrating Co., on Tuesday morning, Harry L. Miller, Assistant Superintendent of Mines, American Zinc Co. of Tennessee, described the testing and adoption of airleg drills to replace column-mounted drills. He also compared airleg drilling with jumbo drilling at the mines of his company. He pointed out that experiments with ¾-in. hexagonal steel had been encouraging and that American zinc will gradually expand the use of the small steel. The use of airlegs produced a substantial reduction in total mining costs while mining contractors increased their pay, in spite of some reduction in hourly wage. The company has not yet developed hard and fast rules governing the choice of jumbo or airleg machines. Apparently for large, thick, relatively uniform ore bodies, the jumbo gives lower costs. The airleg is more suited for irregular, thin ore bodies.

L. T. Postle, President and General Manager of the Granby Consolidated Mining, Smelting & Power Co., Ltd., described experience at Copper Mountain, B. C., which led to the replacement of air-driven diamond drills by percussion drills using jointed rods and tungsten-carbide bits for long hole drilling. He pointed out that there is still much room for improvement, and indicated that the next few years promise to be extremely interesting ones in drill development.

In speaking of longholing at the Gold King Mine, E. H. Lovitt, president, Lovitt Mining Co., Inc., dealt more with differences in the use of long hole drilling than with particular costs. Long-hole percussion drilling has proved satisfactory for sampling at this mine. Lower costs, compared with diamond drilling, have permitted the sinking of a sufficient number of holes to obtain very accurate estimates of grade. There is seldom as much as five percent difference between estimated and drawn grades.

Ring-drilling blastholes from sublevels, drifts and crosscuts has proven to be a flexible and economic method of mining larger ore bodies. Four-in. automatic Leyners on 48-in. aluminum shells have given the most satisfactory performance in drilling the long hole rings for blasting. Pusher-type drills, because of their light weight and ease of setting up are considered most satisfactory for testing the walls of the stopes and drifts.

C. M. Beck, assistant general manager, Algoma Ore Properties, Ltd., gave a paper on long hole drilling and funnel mining at the Helen Mine. He spoke on an application of long hole drilling rather than on the technique of the drilling itself.

A jaw-crusher was installed about a thousand ft below the surface and the ore funneled into it without any intermediate transportation. Ore was broken both by churn drilling from the surface and by long-hole drilling. Beck pointed out that the angle of the ore passes in "funnel" mining is very critical. The whole theory of this mining system is based on the idea that large rocks have a lower angle of repose than small rocks. If ore is allowed to flow at a certain critical angle (between 40 and 43 deg), the large rocks work their way up to the surface where they can be detected and blasted.

Tell Ertl, chairman, Department of Mining & Petroleum Engineering, Ohio State University, talked about rotary drilling in hard rock. Dr. Ertl discussed the possibilities of rotary drilling in hard formations. He felt that research and development in the future would provide the metal mining industry with rotary drills which would offer much faster drilling rates at low operating costs.

UNDERGROUND MINING METHODS

ON Tuesday afternoon, a session on Underground Mining Methods was presided over by Henry H. Bruhn, resident manager, United States Potash Co.

Harold B. Ewoldt, vice-president, White Pine Copper Co., spoke on Mining and Milling Plans at White Pine. He described the ore body, the history of White Pine, the mining plan for the new property and the milling process which will be used to beneficiate the ores from this low-grade copper deposit.

H. H. Wells, superintendent, Lark Section, U. S. Smelting Refining and Mining Co., described how the use of fork lift and straddle trucks to handle packaged timber and supplies at Lark since 1949 have reduced handling costs, for timber alone, 32 percent on the surface and 12 percent underground. This was done even though wages during the same period increased approximately 22 percent.

Earl H. Miller, Assistant Resident Manager, U. S. Potash Co., spoke on underground diesel haulage practices at United States Potash Co. Diesel equipment was first used underground at the mine of the U. S. Potash Co. in 1950. Mr. Miller described his company's efforts to develop scrubber units to effectively treat the exhaust

Assayer Wm. E. Beaudette explains the intricacies of his craft

from diesel engines. He went on to outline their efforts to keep diesel exhaust gases from contaminating mine air and concluded by stating that the underground use of diesel equipment is growing and should continue to grow if care is used in making the application.

H. A. London, Superintendent of Maintenance & Construction, Duval Sulphur & Potash Co., traced the use of diesel equipment underground and outlined recent developments in diesel haulage in the potash mines of New Mexico.

Trackless mining at Canadian Exploration Ltd. was described by G. A. Gordon, General Manager, Canadian Exploration Co. Starting with early mining methods used by his company, he discussed the transition from on-track to trackless mining at the Canadian lead property. Overhead loaders load broken ore into trucks for transportation. In addition a 1¼ cu yd scoop shovel is being tried experimentally. Diesel powered trucks are used for transportation and a semi-trailer type unit is also being tested.

H. E. Pruner, sales manager, Conveyor Belts, U. S. Rubber Co., described recent advances in belt design and the operational advantages inherent in belt conveyors for underground ore transport. He pointed out the advisability of considering several types of belt construction when designing new belt conveyor drives or when conventional duck belts need replacement.

Modern practices in underground haulage were discussed by J. H. East, Jr., regional director, Region IV, U. S. Bureau of Mines. Emphasizing that attention should be concentrated not so much upon the handling of a loaded car but rather upon the technique of putting the empty car into position to be loaded, Mr. East described several modern, well-engineered haulage systems. He outlined advances in haulage equipment for coal mining and predicted that the day will come when diesel-powered equipment will be in common use underground and mobile and conveyor equipment will largely supplant track type haulage.

A paper by Ralph E. Kirk, manager, Raw Materials, Tennessee Coal & Iron Division, U. S. Steel Corp., described operating experience with 14-ton capacity diesel-electric shuttle cars in the ore and limestone mines of TC&I.

THE Wednesday morning session on underground mining methods was held under the chairmanship of Franklin Coolbaugh, vice-president, Western Operations, Climax Molybdenum Co. This session was divided into two parts. The first had to do with shaft sinking and hoisting, the second was given over to a symposium on block caving.

Ted Olds, mine foreman at the Bunker Hill & Sullivan Mining & Concentrating Co., delivered a paper written by himself and Stanley W. McDougall, manager of mines. They described the methods and equipment that permitted them to break all shaft sinking records for the Coeur d'Alenes by completing over 2000 ft of shaft, seven shaft stations and two pocket raises in slightly over 11 months. This was made possible by mechanization of every operation possible.

Guy N. Bjorge, vice-president, Homestake Mining Co., presented a paper on the Koepe, or friction type hoist. This type is used almost exclusively in Europe but until recently was almost unknown in the United States and Canada. The Cleveland-Cliffs Iron Co. and the Falconbridge Nickel Mines are now in process of installing hoists of the Koepe type.

M. K. Hannifan, assistant general superintendent of the Kelley Mine, Anaconda Copper Mining Co., described the Greater Butte Project in some detail and went on to point out where present practice departed from the basic scheme. Draw points are more widely spaced and pillars left now are larger than planned for originally. Boundary slice work has been abandoned and mechanical mining is practiced on the lower lifts, with underground conveyors taking the load that proved too much for a conventional haulage system.

Robert Henderson, resident manager, Climax Molybdenum Co., outlined some of the difficulties met and surmounted at Climax. He pointed out that the caving system at Climax has also been modified over the years. These changes have been dictated by a number of considerations. Chief among these were: size and shape of the ore body; production requirements; importance of draw control and draw point spacing; ventilation; servicing of working places and supply handling; safety, communications, and material and equipment available.

Jack W. Still, general superintendent, Miami Copper Co., drew on 29 years' experience in block caving at Miami for his paper. He enumerated the changes that have taken place in practice over this period, and pointed out that while present practice is based on long experience with large tonnages, there are often cases (smaller ore bodies or short life areas) where even these well-tried patterns are abandoned in favor of temporary expedients to achieve maximum tonnage per dollar expended.

J. F. Buchanan, mine manager, San Manuel Copper Corp., described the development work being done on the first lift of the San Manuel sulphide ore body. The major portion of this first area will be mined by the full gravity, or branch raise, system. Some low-head areas on the fringes will be mined with slushers. Initial blocks will have six or seven grizzly lines, so blocks will be 210 by 210 or 210 by 245 ft.

In mining practice, San Manuel has chosen tried systems. All units have been used successfully at other properties. Main difference is that the initial undercut is farther from the surface than at other like projects. In ore haulage and hoisting, heavier units have been chosen than were available when other properties were planned. It should be possible to handle 35,000 tpd when the mine is in full production.

DRILL STEEL SYMPOSIUM

A SESSION on Wednesday afternoon was dedicated to a series of papers on drill steel. Chairman William H. McCormick, chief metallurgist, Crucible Steel Co. of America, pointed out that this panel session was a new departure.

B. F. Shepherd, chief metallurgist, Ingersoll-Rand Co., pointed out that problems with drill steel arise from efforts to transmit energy from drilling machine through the drill rod to shatter rock at the bottom of the hole. He went on to explain procedures designed to provide the scientific information needed to study drill steel and obtain the longest life possible from any type of drill rod.

T. E. Norman, chief metallurgist, Climax Molybdenum Co., discussed reasons for drill rod failure and suggested a number of ways drill steel life might be prolonged by reducing fatigue failure. Both these papers appear in full starting on page 28 of this issue.

William F. Towne, supervisor, Bethlehem Steel Co., pointed out that with new methods for fabricating steel, new drilling machines and bits, many steels with analyses that have not been satisfactory before may deserve a new trial. In fact, he said, as conditions of use change, continuing testing programs for old and new steels are a must. What seems a mediocre steel today may be the superior drill steel tomorrow.

Peter Payson, research metallurgist, Crucible Steel Co. of America, analyzed the effects of heat treatment on different types of drill steel. He pointed out particularly the dangers and pitfalls inherent in the heat treatment of both ordinary carbon steels and the high alloy steels.

Floyd R. Anderson, chief metallurgist, Gardner-Denver Co., continued the topic of steel treatment. He outlined various methods of mechanically treating drill steel to prolong its useful life.

Raymond J. Marcotte, quality control manager, Calumet & Hecla, Inc., pointed out that all too often the potential life built into drill rod by the

manufacturer is lost through mishandling and abuse in the shop and underground. He illustrated his point by quoting data from Calumet & Hecla's experience, and concluded with the admonition that control in the rod shop and mine can result in greater realization of the life built into every drill rod.

In a program of this type audience participation is particularly desirable and during the discussion period that followed Marcotte's paper the number of questions and comments from the floor indicated the depth of interest of the mining men present.

OPEN PIT MINING

IN opening the session on operating problems in open pit mines on Thursday morning, Robert W. Hughes, Vice-President and General Manager, Miami Copper Co., pointed out that this was not to be a session where the mechanics of operating an open pit mine would be discussed. Rather it was intended to cover unusual developments in three operations that make up those mechanics, namely breaking, loading and haulage.

P. D. I. Honeyman, vice-president and general manager of Inspiration Consolidated Copper Co., in a paper on the "New Look" at Inspiration, dealt with the problems met in converting from underground to open pit operations. "In this era of change," he said, "a new look is necessary. At Inspiration this involves a broader approach by management and staff . . . Only by recognizing the constant need for change and development will it be possible to meet new problems as they arise."

J. C. Van De Water, general superintendent of mines at Kennecott's Ray Mines Division, discussed open pit operations in old caved areas. In moving into such areas with open pit mining methods operators can count on recovering much ore already broken and left behind in the first mining. Disadvantages seem small and can be disregarded, after careful planning to minimize their effects.

George W. Colville, assistant general manager, Bagdad Copper Corp., spoke on the Bagdad Open Pit Conveyor. Here again the problem was one of converting from underground to open pit mining. Because of steep grades it was decided to install a conveyor 40 ft above the underground haulage level to move the ore from the pit to the secondary crushing plant. Primary crushers were placed ahead of the conveyor in the pit. Since the conveyor has been in operation, mine output has increased from 682,000 tons in 1944 to 1,230,000 tons in 1953. The increase in production has been accompanied by savings in manpower and transportation costs. There has also been a five-fold increase in ore storage and the addition of another stage of crushing.

T. A. Snedden, manager of the Southwestern Division, American Smelting and Refining Co., in his paper on the Silver Bell pit development, had another problem to contend with. The Silver Bell was developed as an open pit mine. Haulage was the principal problem here and trucks are used almost exclusively. Work is still under way to determine the best type of surfacing to use to insure long road life and low maintenance costs.

C. E. Mills, manager, Phelps Dodge Corp., described the rail-truck haulage system used in the new Lavender Pit. He explained the considerations that entered into the choice of this combination haulage system.

B. R. Coil, assistant general manager, Miami Copper Co., described the feat of moving the Castle Dome open pit operations to the new Copper Cities mine 15 miles away. This entailed moving a 12,000 ton concentrator and all equipment and meshing this operation with continued production from the Castle Dome property until its final exhaustion. The work was all done without the help of outside contractors.

In describing the Yerington property, recently opened by the Anaconda Copper Mining Co., H. R. Burch, mine superintendent, stressed two points. First was the unusual amount of ground water that had to be handled, second was the necessity for selective mining to keep mill grade constant. He also described the company's interesting Leviathan Sulphur mine.

Kenneth B. Powell, superintendent of Raw Materials Operations, Kaiser Steel Co., was the concluding speaker. His paper dealt with the difficulty of keeping personnel on the job and happy at an isolated property such as the Eagle Mountain Iron Mine. He discussed the problem and its solution from three standpoints. First, the effect of high summer heat on efficiency, second the effect of the same heat on Labor turnover, and third its effect on the comfort of personnel and their families.

RICHARD W. WHITNEY, General Manager, Minnesota Mines, M. A. Hanna Co., was chairman of a session dealing with improved equipment in open pit mines on Thursday afternoon.

Thomas M. Ware, Vice-President of Engineering, International Minerals and Chemical Corp., in a paper called "Scientific Mining Increases Profits," described the work done by his company in applying the techniques of human engineering and operations research to mining. International has profited from the application. Mr. Ware said that, in his opinion, the work started at his company's phosphate operations would eventually lead to greater economies throughout the mining industry and result in increased productivity for mining and for the nation.

Lewis A. Parsons, consulting engineer for Calaveras Cement Co., compared two types of rotary drills with the churn drills formerly used to drill large blastholes at Calaveras' No. 1 Quarry. This paper was carried in full in the October JOURNAL.

Continuing the topic of blasthole drilling in open pit mines, L. E. Snow, general foreman of drilling and blasting for Kennecott Copper Corp., presented a paper on mobile drill improvements at the Utah Copper Pit. Use of mobile drills at the big pit reduced the man count of the drilling department 34 percent; did away with 60 miles of compressed air line and a

Each exhibit had its cluster of interested information seekers

$105,000 central compressor together with 94 conventional drills and thus cut way down on supply and maintenance costs. The installation has resulted not only in faster, cheaper drilling of holes but has also brought many other improvements to the operation.

MILLING AND METALLURGY

ON Wednesday afternoon a Milling and Metallurgy session was held under the chairmanship of L. J. Erck, chief metallurgist, Cleveland-Cliffs Iron Co.

P. H. Ensign, general superintendent of mills, Utah Copper Division, Kennecott Copper Corp., reported on improvements in flotation practice and modernization of electrical equipment at Kennecott's Arthur and Magna Concentrators. He reviewed test work conducted, the installation of flotation machines selected as the result of such test work, and performance of these machines as they were incorporated in a revised flotation of flow-sheet. Improvements in flotation at both mills were directed toward the treatment of copper plant tailings, previously discharged to waste. A fair percentage of mineral values contained in the wasted tailing are now being recovered at very little additional cost.

Interlocked with the flotation program was a program of modernizing an outdated electrical system. The new system embodies not only new electrical advantages, but provides the features of flexibility of section isolation. This permits the constancy of milling operations so necessary to maintain metallurgical efficiency.

This paper was followed by a short discussion from the floor, after which a symposium on crushing, grinding and classification was held.

John F. Myers, consulting engineer, presented a paper prepared by Louis Erck on the grinding and classifying circuits at the Humboldt Mill of Cleveland-Cliffs Iron Co. and Ford Motor Co. There are some unusual features of this mill. First an experimental high-speed rod mill has been installed so it can be cut into the grinding circuit at will. Second the hydroscillator, relatively unproven in the industry, has been included in the circuit, apparently with excellent results.

The plant has not been in operation long enough to make final results known, however, so far the mill operates reasonably close to the limits as originally set out by pilot practice. Tonnage-wise it has exceeded calculations and as improvements and adjustments are exacted, the record will continue to be better.

R. G. Fleck, assistant manager, New York Ore Division, Jones & Laughlin Steel Co. presented a progress report on the Aerofall Mill. The Aerofall Mill, a complete mineral crushing unit of revolutionary design, is a combined crushing and grinding unit. It can take run of mine, minus 18-in. sized, material and reduce it in a single operation to as fine as 99.8 percent minus 325 mesh. It combines the four basic principles of comminution by abrasion, crushing through impact, crushing through free-fall impact and attrition through grinding. One of the principal advantages advanced for the use of the Aerofall Mill in the treatment of Benson Mine ore, according to Mr. Fleck, was its ability to unlock the iron minerals from the gangue without overgrinding and thereby improve the grade by reducing the quantity of middlings produced.

Kellogg Krebs, metallurgical engineer, San Francisco, described recent advances in the use of wet cyclones and improvements in their design. Their application in several mills was also discussed.

By the use of five flow sheets, R. H. Lowe, field representative, American Cyanamid Co., outlined the current trend in the use of heavy density processes as a tool of the mineral industry. He pointed out that the trend is toward simplification of the flow sheet as a result of improvements in equipment.

ON Thursday afternoon, Norman L. Weiss, milling engineer, American Smelting & Refining Co., presided at a second Milling and Metallurgy Session.

A. J. Gould, plant superintendent, Yerington Mine, Anaconda Copper Mining Co. described the general operation and discussed specific operating problems of Anaconda's sulphuric acid producing plant at Weed Heights. FluoSolids roasting is used to provide sulphuric acid for use in the company's copper recovery plant. A discussion period followed Mr. Gould's paper.

A panel on mill construction and design followed. Howard R. Keil, mill superintendent, the Carlton Mill, Golden Cycle Corp., spoke on "Innovations in Modern Cyanide Plant Design." He described the design of the Carlton Mill in the Cripple Creek district of Colorado. This mill replaced the Golden Cycle mill at Colorado Springs, Colo. One of the main innovations was the use of the carbon cyanidization process. After operating the carbon process for over three years, the company feels that the process has application in cyaniding certain types of ores and the possibilities of using this process should be investigated on any new installation.

W. R. Easley, manager, Western Division, Western-Knapp Engineering Co., outlined points to be considered in planning a new mill. He stressed the planning stage of mill design and pointed out that a $20,000 automatic control installation, which will definitely save the labor of one man, can usually be considered a good investment. By careful planning in the early stages mill construction will be made simpler and the end result will be a better plant.

In discussing automatic controls H. V. Hughes, manager of the Industrial Division, Southwestern Engineering Co., said, "There is a place for automatic controls, however they are not the panacea for all mill problems." He pointed out that careful study should be made before selection of such controls and that each installation was a separate engineering problem.

Harry L. McNeil, metallurgical engineer, Stearns-Roger Manufacturing Co., spoke on preliminary design criteria for dust control. He discussed the problems caused by dust in various stages of ore treatment. He pointed out that the dust collection problem at the primary crusher was entirely different from the dust collection problem in a secondary crushing operation. He said there is a lack of information on dust handling but in recent years, the mill man has become dust conscious. Procedures will be developed in the near future to control dusty operations, to collect dust at the source and transport it safely away. Mr. McNeil then went on to discuss experience in transporting various types of dusts in air ducts.

O. W. Walvoord, O. W. Walvoord, Inc., took a new look at mill buildings.

The design of mill buildings has come a long ways since the first crude shed was set over an ore-dressing machine, according to Mr. Walvoord. But much can still be done to produce better buildings, structurally, functionally and architecturally. He went on to cover in detail such phases of mill design as choice of site, appearance, plans for future expansion, type of building, method of construction, color dynamics and labor costs. He concluded by saying the mill building design is difficult and complex, but good design will result in construction of a mill which effectively performs all its intended functions and still looks like something.

SAFETY

AT the Safety Conference on Wednesday afternoon, with Albert F. Knorp, secretary of the California Chapter, American Mining Congress in the chair, an attentive audience heard A. H. Zeilinger, superintendent of safety, Colorado Fuel & Iron Corp., give a talk on "Selling Safety to Employes." According to Mr. Zeilinger the job of selling safetymindedness to employes is peculiarly one for the foreman. He outlined the steps whereby the supervisor can gain the attention and finally win the wholehearted

cooperation of the men under him in a safety program.

Warren S. Brown, safety engineer, Pacific Coast Aggregates gave a resume of safety practices in the small plant where management and engineering as well as safety, are usually handled by one man. In such cases he said the personal contact between the chief and all those working in the plant can be a decided help in building the esprit de corps so necessary to the successful prosecution of a safety program.

J. G. Huseby, assistant manager of the Mountain Copper Co., spoke on the value of the California Industrial Safety Conference. He pointed out the vast improvement in the accident records in all California industry since the organization of the conference. He also predicted that the record would continue to improve as more and more segments of industry came to cooperate in the movement.

Speaking on "Safety Organization—What Do You Want To Do About It?" Leonard R. Flicker, Safety Engineer, Permanente Cement Co., reviewed the accomplishments in safety during the last ten years, especially in the Mining Industry. He pointed out, however, that after 40 years of accident prevention work, we are reaching only 10 percent of the employed personnel of the country. For those who want to do something about this he outlined ways of enlisting full support of management. He pointed out that if industry itself does not do a creditable job, the matter of safety will be taken out of its hands and made a matter of legislation. "The choice," he said, "is up to you."

Ronald C. Griffin, Production Manager, Consolidated Rock Products Co., reviewed the advances made in recent years in safety practice in Southern California. His report, based on a personal survey, showed marked advances and a wholesome attitude on the part of all the major companies operating in that part of the country.

STRATEGIC MINERALS LUNCHEON

S. H. WILLISTON, president, Cordero Mining Co., presided at the Strategic Minerals luncheon on Wednesday. Hon. J. Bracken Lee, governor of Utah, was the principal speaker.

The Governor pointed out that unless everyone takes an active interest in our country and our Government, and takes advantage of his franchise to vote, the future will look pretty black.

He said, "The only way that you are going to bring about a change of the trend of the last 30 years in government is through the people themselves."

"I have great confidence in groups of people," he declared, "That is our system of Government." When groups get together to weigh both sides of any question, they will come up with the right answer.

He called upon the mining industry to get together; to decide what is best for the industry, not just for the immediate future but for the long run; and having decided what is best, to fight for it.

Governor Lee urged the people of this country to stand up and shout for what they want just as loud as do the Communists and left-wingers. He concluded by saying what this country needs is some common sense in Government.

TUNGSTEN, CHROME, ASBESTOS

A NUMBER of special conferences were arranged for Monday afternoon at the request of interested members of the industry, to consider the problems of particular minerals.

These conferences dealt with Tungsten, Chrome and Asbestos, and discussions centered upon the administration, length and terms of Government purchase programs for these minerals. Government officials, including Dr. John Morgan of the Office of Defense Mobilization and John C. Liebert of the Interior Department, participated in the discussion and answered questions as to conduct of the programs.

The meeting on Tungsten was presided over by Charles H. Segerstrom, Jr., president of the Nevada-Massachusetts Co. and president of the American Tungsten Producers Association. W. Lunsford Long, president of the Tungsten Institute and vice-president of Haile Mines, Inc., was among those who pointed out the need for a longer term purchase program for tungsten.

The meeting on Chrome was chairmaned by Fay I. Bristol, president of Bristol Silica Co., and president of the Oregon Mining Association. Jack L. Neal, vice-president of the Metate Asbestos Corp. and president of the Arizona Asbestos Producers Association, presided over the asbestos session.

In the course of these meetings suggestions as to a course of future action in each case were outlined by the producers.

TAX CONFERENCES

ON Wednesday afternoon representatives of the cement producing members of the Mining Congress met to discuss special problems of their industry with regard to depletion and other provisions of the new Internal Revenue code. Walter A. Wecker, president, Marquette Cement Manufacturing Co., was chairman of this session and Henry B. Fernald, chairman AMC Tax Committee, led the discussion.

Fernald also served as chairman of the Tax Forum, which met on Friday to review various provisions of the new Code as they affect the mining industry. A large number of tax accountants and mining men interested in this important topic were present and took part in the discussions.

MBD MEETS

ON Friday, September 21, the Minerals Beneficiation Division of AIME held its regular fall meeting at the Fairmont Hotel. There were well attended technical sessions in the morning and afternoon, with a luncheon meeting at noon. At the luncheon meeting Leo F. Reinartz, vice-president Armco Steel Corp., and president of the AIME, was the principal speaker, discussing Institute activities. H. DeWitt Smith, president-elect of the Institute, also spoke briefly.

Will Mitchell, research department, Allis-Chalmers Manufacturing Co. and program chairman for the MBD meeting, acted as master of ceremonies at the luncheon. He called on Julian Conover, executive vice-president, American Mining Congress, who reviewed briefly the activities of the preceding four days. Conover reported on the record-breaking attendance at the Mining Show and expressed the pleasure of the Mining Congress in having so many members of the MBD present.

Operators Corner

Two Ideas Which Have Paid Dividends to Mine Management

Flow Sheet Control

WHEN starting or shutting down the new cleaning plant of the Perry Coal Co. at its St. Ellen mine, O'Fallon, Ill., the plant operator can see at a glance whether or not he has started or stopped the correct piece of equipment at the correct time. Right beside the control panel is a schematic diagram of the plant flowsheet mounted on a ¼ in. steel plate. Each piece of equipment in the plant is designated by a light on the diagram. When a piece of equipment is running, its light burns. In this way the operator can, for instance, see that a belt is running before he turns on the belt feeder.

Unique Coal Loader

A COAL LOADER to put coal into covered trucks has been developed and put into use by Midwest Radiant Corp., Millstadt, Ill. Often trucks carrying livestock into the stock market at St. Louis pick up a load of coal for the return trip. Because they are covered, the trucks are difficult to load. The loading machine is essentially a horizontal conveyor on an electrically-powered truck. The conveyor is long enough to reach from the back to the front of the stock trailers and low enough to clear the roof. To load a truck, the loader is maneuvered under the proper coal chute and the truck backed up so that the conveyor reaches the front. Coal falls from the storage bins into a hopper which feeds onto the conveyor belt. As the truck is loaded it gradually pulls away.

To take full advantage of this trade, Midwest Radiant lowered the ground level under the tipple about 27 in. to allow access to the high-bodied stock trucks.

Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

A RECORD 45 million Americans went to the polls on November 2 and when their off-year election votes were counted a Democratic House of Representatives had been elected and as of this writing the Senate also teetered on the brink of being organized by the Democrats. Uncertainty as to the final outcome in the States of New Jersey and Oregon still remains and upon the outcome of vote checks in these two States hinges the control of the upper chamber. The Republicans need both of these seats to retain control while the loss of either one would throw control to the Democrats. The latest tallies give New Jersey to the Republicans and Oregon to the Democrats, thus swinging both houses to control of the Democratic Party and spelling trouble for the Administration's legislative program.

On the whole the outcome of the voting across the nation did not give any consolation to those that had sought a return to New or Fair Deal aims. Rather, the electorate seems to have returned to office a fairly conservative Congress. Whether the next two years will see the enactment of much legislation is problematical. The outlook appears to lean towards establishment of political issues and lines for the next Presidential election.

The 84th Congress

When the 84th Congress convenes in January 1955, as matters now stand, it will be composed in the House of 232 Democrats and 203 Republicans, and in the Senate of 48 Democrats, 47 Republicans, and one Independent (Wayne Morse of Oregon, who has stated that he will vote with the Democrats to organize the upper chamber).

When the Democrats organize the House, new faces will be seen at the helm of the Committees which grind out the legislation for floor consideration. As it now appears the chairman of the major committees will be as follows:

Agriculture: Harold D. Cooley of North Carolina
Appropriations: Clarence Cannon of Missouri
Armed Services: Carl Vinson of Georgia
Banking and Currency: Brent Spence of Kentucky
Education and Labor: Graham A. Barden of North Carolina
Interior and Insular Affairs: Clair Engle of California
Interstate and Foreign Commerce: J. Percy Priest of Tennessee
Judiciary: Emanuel Celler of New York
Public Works: Charles A. Buckley of New York
Rules: Howard W. Smith of Virginia
Ways and Means: Jere Cooper of Tennessee

Under Democratic control of the Senate, most of the committee chairmanships will go to Southern and Western Democrats. Here are the prospective Democratic chairmen:

Agriculture: Allen J. Ellender of Louisiana
Appropriations: Carl Hayden of Arizona
Armed Services: Richard B. Russell of Georgia
Banking and Currency: J. W. Fulbright of Arkansas
Finance: Harry F. Byrd of Virginia
Foreign Relations: Walter F. George of Georgia
Interior and Insular Affairs: James E. Murray of Montana
Interstate and Foreign Commerce: Warren G. Magnuson of Washton
Judiciary: Harley M. Kilgore of West Virginia
Labor and Public Welfare: Lister Hill of Alabama
Public Works: Dennis Chavez of New Mexico

President Eisenhower has stated that he will try to work closely with the new Democratic leaders as well as his own legislative lieutenants. Rep. Sam Rayburn (Dem., Texas), who will assume the post of House Speaker in the 84th Congress, and Senator Lyndon Johnson (Dem., Texas), who is slated to become Senate Majority Leader, have indicated that they will give fair consideration to the Eisenhower program, but both have issued warnings that promise woe for that program.

Rayburn has declared that his party will try to make the farm program "more serviceable," will review the tax program and iron out "inequities," and will seek a stronger national defense (meaning heavier expenditures).

Johnson called for a huge development program for natural resources, particularly reclamation and conservation projects in the West; increased funds for national defense; a revised farm program; and "higher standards" of living. The last-named proposal implies that the Democrats will seek an easing of Taft-Hartley provisions, and other measures designed to attract wide support from organized labor.

Considerable speculation centers about a possible return to the Republican-Southern Democrat coalition that existed during previous Congresses. Whether this will eventuate remains to be seen.

Meanwhile the Senate of the 83rd

Washington Highlights

INCOMING CONGRESS: Control changes
LAND LAWS: Codification or revision?
STOCKPILING: Requires more funds
TARIFF: Commission holds hearings
COAL: Programs being developed

Congress has returned to discuss a move for censure of Senator Joseph McCarthy (Rep., Wis.), and during this session it is expected that some of the grounds will be laid for exchanging control of both Houses in the new Congress.

Land Law "Codification"?

During the past Congress, a House Judiciary subcommittee made an exhaustive study of the multitude of laws governing reclamation and conservation activities of the Federal Government, including the laws controlling the public domain. As a result of this study, the House Judiciary Committee has prepared a proposed measure to codify and revise Title 16 of the U. S. Code which embraces these activities.

In a proposed report on this tentative bill, the Committee states that the codification does not intend to make any substantive changes in the present laws but rather "to put the law in a form more useful and understandable." However, even a quick scanning of the 674-page proposed bill reveals that a large number of substantive changes would be made, whch are likely to bring forth loud and vigorous protests from natural resource industries.

The proposed measure, which the Committee is circulating among interested persons and industries for comment, deals with the activities of the National Park Service, the national forests, soil and water conservation, water power and valley authorities, Federal Power Commission jurisdiction and regulation, wildlife, and reclamation.

Of particular interest to mining are sections of the measure which would provide that mining locators on public lands in national forests would be subject to regulations of the Forest Service, and would be allowed to use only so much of the surface of their claims as would be required for prospecting, mining or processing of ores. All patents to such claims would reserve to the United States all title in or to the surface of the lands and products thereof, and would not permit use of any of the surface not required for mining activities except under Forest Service rules. These provisions sound much akin to the Hope bill, sponsored by the U. S. Forest Service, and which died with the adjournment of the House.

There are indications that an attempt will be made to introduce this codification measure in the new Congress. The incoming chairman of the House Interior Committee, Rep. Clair Engle (Dem., Calif.) and the ranking minority member, former Chairman A. L. Miller (Rep., Nebr.), have indicated that they will join forces to see that any revisions of the land laws that are made in the codification measure are referred to the Interior Committee for thorough hearings and consideration.

Stockpiling Expanded

Mobilization Director Arthur S. Flemming has declared that another $2.5 billion will have to be spent by the Government to meet minimum national stockpile objectives for strategic and critical materials.

He said that the Government is maintaining a policy of reaching its minimum stockpile objectives as rapidly as supplies become available and without creating undue hardships for the civilian economy.

Meanwhile, the General Services Administration has issued a summary of the Government's acquisition of metals and minerals under purchase programs for tungsten, manganese, chrome, mica, beryl, asbestos, columbium-tantalum, and mercury. The summation shows that through September 30, the Government had acquired about a third of its goal of 3 million short-ton units of contained tungsten; a fourth of the required 37 million long-ton units of manganese; a third of its goal of 200,000 long tons of chrome ore and concentrates; a sixth of its mica goal of 25,000 short tons; slightly less than one-third of the 1500 short tons of beryl required; a little less than half its goal of 1500 short tons of asbestos; about one-third of its 15-million pound requirement for columbium-tantalum pentoxide; and none of its mercury goal of 125,000 flasks.

Tariff Problems Studied

The U. S. Tariff Commission held hearings on October 19-20 to investigate the plight of the domestic fluorspar industry.

Representatives of the industry told the Commission that imports from Mexico during the past year have depressed the market to the extent that many U. S. mines have been forced to close. The industry said that distress areas existed in southern Illinois and western Kentucky as a result of the mine shutdowns. The Commission was requested to recommend that Congress revamp the present tariff rate schedule to protect the domestic industry. Tariff Commission spokesman pointed out that under the resolution calling for the investigation they could only report their findings as to the situation existing in the industry and could not make any recommendations for tariff relief. Also appearing before the Commission were a number of witnesses calling for continuation of a high rate of imports to assure the meeting of domestic requirements.

It is likely that a drive will be made in the next session of Congress to obtain some tariff relief for the fluorspar industry.

Meanwhile, sessions have been opened on the General Agreement on Tariffs and Trade at Geneva. They are likely to run for three months.

Coal Industry Programs

Cabinet committees and task groups continue their studies of ways and means to assist the coal industry to increase production and widen its markets.

In the meantime, it has been made plain that Congressmen and Senators from coal producing States are likely to meet in Washington shortly after the new Congress convenes to discuss plans for aiding the industry.

The Government's program to export some 10 million tons of coal to friendly nations abroad has yet to show much of a result. It has been announced that the Foreign Operations Administration has made arrangements for the purchase of at least 100,000 tons of coal in Kentucky for shipment to Korea. Purchases of the coal by the Government are to be handled by the Defense Department for the present, with the General Services Administration likely to take them over at a later date.

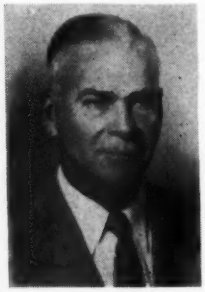
On another coal front, the Interior Department in cooperation with the Department of Commerce has developed a proposed $8.5 million Federal-aid program to prevent flooding of anthracite mines. It is understood that the program has the approval of the President and will be submitted to the next Congress. A Federal appropriation of the $8.5 million will be necessary and it will be made contingent upon a like appropriation from the State of Pennsylvania.

The program was developed following conferences of Federal and State officials and representatives of industry and labor.

AMC Personals

The appointment of **James C. Gray** as vice-president-operations, Coal, of United States Steel Corp., has been announced.

Gray comes to Pittsburgh from U. S. Steel's Tennessee Coal & Iron Division, where he has been manager of manufacturing operations. In his new position he heads the company's coal mining activities in Pennsylvania, West Virginia and Kentucky. He succeeded **Karl L. Konnerth** who resigned effective November 1.



James C. Gray

A graduate of Penn State College in mining engineering, Gray started in 1925 with the Hudson Coal Co. After 12 years' experience in coal mining he joined U. S. Steel in 1937 as superintendent of the Wylam Mine of T.C.I. He was made chief inspector, coal mines, in 1940 and general superintendent three years later. In 1948 he was made assistant manager of raw materials and in 1951 became the T.C.I. Division's manager of manufacturing operations.

R. R. Williams, Jr., has been appointed manager of mines for the Colorado Fuel and Iron Corp. He had been assistant manager of mines at Pueblo for the past year.

Prior to his appointment as assistant manager of mines in December 1953, Williams was superintendent of C.F.&I.'s blast furnace department. Previously, he served as assistant superintendent of that department.

He succeeds George H. Rupp, former manager, who died October 11.

Richard A. Mullins, former chief chemist, Ayreshire Collieries Corp., Danville, Ill., is now with the Enos Coal Mining Co., Oakland City, Ind.

Heath Steele, vice-president of the American Metal Co., Ltd., resigned November 4 as a director. He will retire as vice-president on December 31 after thirty-seven years of service. He will become a consultant to the company. **Hugo de Neufville**, vice-president in charge of Smelting and Refining Operations, who has been with the company since 1927, was elected a director.

Vane R. Gregory, formerly general engineer with the Pittsburgh engineering department of Eastern Gas & Fuel Associates, has been promoted to property engineer for the company. He succeeds **Joseph E. Selig**, who retired recently.

Elton Clark has been named chief engineer of mining operations at the Burro Mountain Mine of Phelps Dodge Corp. The mine is located at Tyrone, N. M. Clark had been with the engineering staff of the U. S. Smelting Refining and Mining Co. at Vanadium, N. M., for several years.

Howard S. Turner, director of the Research and Development Division of Pittsburgh Consolidation Coal Co. has been name vice-president of research and development of Jones & Laughlin Steel Corp.

Ward W. Minkler, formerly Pacific Coast manager of sales and technical service, has been named assistant manager of Market Development of the Titanium Metal Corp. of America. He has assumed his new duties at the general sales office in New York.

Ward W. Minkler

Prior to joining Titanium Metals Corp. of America, Minkler was employed by the Babcock & Wilcox Co., Tubular Products Division, as a member of the metallurgy staff.

M. E. Gillespie has been appointed superintendent of the Stanaford No. 1 mine of the New River Co. Stanaford No. 1 is located in Riley County, W. Va. Gillespie was formerly superintendent at the company's Skelton and Oswald mines.

Harold L. Childress, president of the Tri-State Zinc & Lead Ore Producers Association, has announced the appointment of **Hugh Wright** as secretary of the Association. The position had been vacant since the resignation several years ago of C. E. Stover.

Wright has worked in public relations departments of the National Lead Co. and St. Louis University.

Lloyd M. Scofield, mining geologist and registered professional mining engineer, has announced the opening of a consulting office at 1014 Fidelity Building, 14 W. Superior St., Duluth 2, Minn.

Neil S. Edmonstone, a director and secretary-treasurer of Steep Rock Iron Mines, Ltd., has been named vice-president of the company.

R. M. Lloyd, vice-president, United States Steel Corp., has announced the appointment of **Philip W. Chase** as assistant vice-president-raw materials, and **August J. Breitenstein** as director-exploration and planning of the corporation.

Chase joined U. S. Steel in 1948 when he became the Oliver Mining Division's manager-special investigations and explorations. In 1951 he was transferred to the position of director-Exploration and Development with U. S. Steel in Pittsburgh.

A. J. Breitenstein

Breitenstein joined the steel corporation as a mining engineer with the H. C. Frick Coke Co. in 1941. He was made assistant chief engineer in 1942 and chief engineer in 1944. Since 1953 he has been serving as director of planning in the Raw Materials Division of U. S. Steel.

E. P. Newhard, vice-president, operations, Penn-Dixie Cement Corp., recently announced that effective November 1, **J. F. Voelker**, formerly superintendent at Plant 4, was appointed chemical engineer for the Corporation, with headquarters at the General Office at Nazareth. He succeeded **William P. Gano**, who is retiring at the end of the year after 51 years of service with Penn-Dixie and two of its predecessor companies.

John H. Jones was appointed superintendent at Plant 4, effective November 1, 1954; having been transferred from Plant 2 where he has been superintendent since January 1952.

O. J. Glantz was appointed superintendent at Plant 2, effective October 16, 1954.

J. D. Geery, former chief engineer, West Virginia Coal & Coke Co., Omar, W. Va., is now chief engineer Ethel Chilton mines, Ethel, W. Va.

J. S. Roper has assumed the duties of manager of the Howe Sound Co., Chelan Division, succeeding **John J. Curzon** who has severed his connections with the company.

C. M. White, president of Republic Steel Corp., who has been president of Reserve Mining Co., recently announced that **W. M. Kelley** has relinquished his position as vice-president in charge of operations of Republic and has been elected president of Reserve Mining Co.

Reserve Mining is jointly owned by Republic and Armco Steel Corp.

"It is planned that the president of Republic and of Armco will alternate each year in filling the newly created position of chairman of Reserve's board, and **W. W. Sebald**, president of Armco, has been elected chairman for the ensuing year," White said.

Robert H. Hughes, president of Clinchfield Coal Corp., Dante, Va., has been named to receive the Pi Tau Sigma Richards Memorial Award.

The award, which is administered by the Board on Honors of the American Society of Mechanical Engineers, is conferred annually on a mechanical engineer 45 years of age or younger, for "outstanding achievement in mechanical engineering within 20 to 25 years after graduation.

Robert H. Hughes

The award will be conferred at ASME's annual meeting in New York, November 29-December 3, 1954.

Percy S. Gardner, Jr., former superintendent of the Silver Dollar mine, west of Wallace, Idaho, has become associated with Frank Eichelberger & Associates, Spokane, Wash., mining engineering firm.

George E. Keller has been named manager, Coal Evaluation, U. S. Steel Corp., Pittsburgh. Previously he was chemical director, Commercial Testing & Equipment Co., Charleston, W. Va.

Elmer V. Reinhardt, geologist, formerly with the Hunt Oil Co., has entered into consulting practice specializing in uranium. He can be reached at 202 North 7th Street, Grand Junction, Colo.

— *Obituaries*—

George Herbert Rupp, manager of the Mining Department of The Colorado Fuel and Iron Corp., died October 11 in Pueblo, Colo.

He attended Michigan College of Mining and Technology, receiving bachelor's degrees in science and mining in 1911. Following college, he became engineer for the Gogebic County Road Commission, and later worked for the Newport Mining Company in Newport, Mich. In 1914, he formed a partnership to operate an independent ore exploration firm. Later, he sold his mining interest and worked as superintendent of the Imperial Mine of the Ford Motor Co. From 1927 until 1929, he was associated with Calumet and Hecla Consolidated Copper Co. at Calumet, Mich., and in 1929 he joined The Colorado Fuel and Iron Corp. Later he was named manager of the Mining Department, a position he held until his death.

George Herbert Rupp

As manager of CF&I's Mining Department, Mr. Rupp supervised exploration programs for coal, limestone, iron ore and other minerals, directed the development, opening, and operation of iron ore mines, limestone and other quarries, and the development and opening of the new Allen coal mine in southern Colorado. He was an exponent of modern mining techniques, and during his years of supervisory service CF&I mines won many national safety awards.

James J. Carrigan, retired manager of mines of the Anaconda Copper Mining Co., died suddenly October 17.

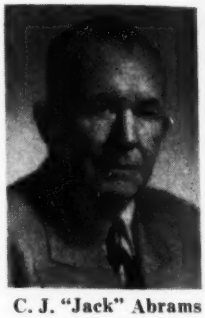
In his 40 years at Butte, Mont., Mr. Carrigan rose from mucker to manager of mines. Born at Hancock, Mich., in 1886, he was graduated from the Michigan School of Mines in 1907 as a mining engineer and went directly to Butte. He worked as a miner until 1910 when he joined the company's geological department. In 1912 he was made shift boss at the Badger Mine, and in 1914 he was appointed safety engineer for the company. In 1915 he became superintendent of zinc mines.

In 1926, Mr. Carrigan was named chief assistant general superintendent of mines, and in 1930 general superintendent of mines. He was appointed manager of mines in 1940, the position he held until ill health forced his retirement in 1947.

William A. Knox, 78, president and founder, Little Ajo Mining Co. and the Knox-Arizona Mining Corp., died August 9 in St. Louis, Mo.

Mr. Knox died of a heart ailment. A prospector in the Southwest in the early 1900's, he found the Little Ajo in 1917 and established the Knox-Arizona Copper Mining Corp., a holding company, in 1952.

C. J. "Jack" Abrams, 64, director of the exploration division of Climax Molybdenum Co., died October 17 at his home in Denver, Colo., after a lengthy illness. He received his mining engineering training at the University of California, came to Climax in 1928 and served as superintendent of both mine and mill before becoming general superintendent in 1939. In 1951, he moved to the company's Denver offices as manager of Western operations, from which he advanced, in 1953, to the position held at the time of his death.



C. J. "Jack" Abrams

Edward M. Portz, 74, retired Bunker Hill & Sullivan Mining & Concentrating Co. electrical engineer, died in mid-October. Mr. Portz retired from the Bunker Hill in 1945.

Ezra Van Horn, 72, died unexpectedly in Cleveland, Ohio, October 28. Mr. Van Horn was executive vice-president of the Ohio Coal Association in Cleveland, a position he had held since 1933. Before that time he was associated with the Clarkson Coal Co. interests. He was widely known for his efforts in behalf of the coal industry. At the time of his death, Mr. Van Horn was serving as chairman of the Executive Committee of the Coal Producers Committee for Smoke Abatement and was active on various industry committees. From 1939 to 1949, he was chairman of the Joint Wage Conference, dealing with labor contracts. Mr. Van Horn was the operators' first trustee of the United Mine Workers Welfare Fund.

Ezra Van Horn

Eastern and Central states

Top W. Va. First Aid Team

A first-aid team representing the Gary mining operations, United States Steel Corp., captured first place in the West Virginia Mine Safety Day competition at Charleston, W. Va., October 2.

The Gary group, working with precision under Capt. John Dickinson, scored 1493 points out of a possible 1500 to amass the best score among 43 teams. It was the largest field in the history of the meet.

One point behind the winners was an Eastern Gas & Fuel Associates squad from Barrett, Boone County, while third place went to an Eastern Gas & Fuel's team from Keystone mine, McDowell County, with 1489 points.

Awards were presented the teams by J. J. Forbes, director, U. S. Bureau of Mines; Harry Gandy, Jr., safety director, National Coal Association; and George Deike, Sr., chairman of the board, Mine Safety Appliances Co.

Sell Culm Bank Material

The Philadelphia and Reading Coal and Iron Co. have announced the execution of contract with the Lincoln Anthracite Co., Schuylkill Haven, Pa., covering the sale of approximately 2,000,000 tons of raw material at its Lincoln Slush Bank near Tremont, Pa.

The agreement provides for an initial payment of $800,000, plus a stipulated per-ton sum as material from the bank is processed in the purchaser's preparation plant. Under the terms of the agreement, The Philadelphia and Reading is the selling agent for the product recovered from the bank.

The initial payment of $800,000 has been added to P & R's cash in its working capital.

Kentucky Safety Day

Brier Creek Mine of the Crescent Coal Co., Muhlenberg County, Ky., had the first-place team in the 18th annual safety program of the Western Kentucky Mining Institute. This is the fourth year this team has finished first in the contest, held at Madisonville, Ky., October 3.

Moss Hill Mine, Bell & Zoller Coal Co., Hopkins County, was second; Oriole Mine, Bell & Zoller Coal Co., Hopkins County, was third; Dawson Daylight Coal Co. Mine, Hopkins County, was fourth; and the Graham Mine, W. G. Duncan Coal Co., Muhlenberg County, was fifth.

Indiana Gypsum Mine

Melvin H. Baker, board chairman, National Gypsum Co., (Buffalo, N. Y.), recently disclosed that a mine and plant are being developed in southern Indiana, near Shoals, in Martin County, on a massive gypsum deposit recently discovered by National Gypsum geologists. Completion of these projects, which will serve a growing market in the central west, is expected by the middle of next year, Baker said.

Iron Works Made Museum

A $1,500,000 restoration of America's first successful iron works has been dedicated as a living museum.

The ancient Saugus Iron Works, at Saugus, Mass., which functioned from 1646 to 1670—now fully reconstructed by the American Iron and Steel Institute—had a capacity of hardly more than a ton of cast iron a day.

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Lithium Corp. Progress

In a mid-year interim report, Herbert W. Rogers, president of Lithium Corp. of America, Inc., reported increase in sales and profits for the first six months of this year over the first six months of 1953. Rogers stated that the company's much-improved financial picture was due to increased operating efficiency and improved plant procedures.

Of major interest was the purchase of 36 mining claims in the Cat Lake area of Manitoba.

The company's plant expansion program at Bessemer City, N. C., was reported proceeding on schedule. Mining operations have begun, and the plant will be in production on or before January 1, 1955.

Reopen Manganese Mines

Virginia Ore Corp. announced in mid-September that it will reactivate the Crimora manganese mines near Waynesboro, Va., late in 1954. The properties were first operated in the 1860's.

The mines were active during both World Wars but have been closed since the end of World War II.

Launch Safety Program

Falls of ground, mining's No. 1 accident killer, will be attacked in an intensive new program to be launched by the National Safety Council on January 1, 1955, with the goal of slashing the annual killed and injured toll by 50 percent.

"Although we realize we are setting our sights high, we feel that this is the only way to attack a problem that results in death or injury to one out of 50 non-coal miners each year," said John L. Boardman, chairman of the Anaconda Copper Mining Co. Bureau of Safety, and chairman of the campaign.

"Falling ground is and always has been the biggest accident problem in the entire mining industry, accounting for about 420 deaths and 7500 disabling injuries annually in the United States mines alone."

The National Campaign to reduce falls of ground accidents in mines is sponsored by the mining section of the National Safety Council. All non-coal mines in the United States and Canada may participate in the campaign providing 25 or more employes work underground. Membership in the Council's Mining Section is not required. Non-member companies may obtain Council materials for conducting the campaign at member prices instead of the usual charge of double the member cost.

Endorsing and cooperating in the campaign are the U. S. Bureau of Mines, the American Mining Congress, state and provincial mining departments, mining associations, mining publications and others having an interest in safety in mines.

The requirements for participating in the campaign are:

(1) Companies that operate two or more mines must enroll each mine separately.

(2) Each participating company agrees to provide the Mining Section with a simple report of injuries resulting from falls of rock and ore for the year, or two or three years, previous to 1955, depending on the period for which records are available.

(3) Each participant agrees to send in a report of accident experience at the end of the first six months of the campaign and a final report covering the last six months.

The falls of ground campaign will cover the calendar year ending December 31, 1955. To facilitate the promotion of safety in participating mines, the Mining Section will provide a suggested plan for systematically using materials and carrying on activities. Each company may select the materials and activities most suitable for its needs and schedule them during the campaign as deemed most effective.

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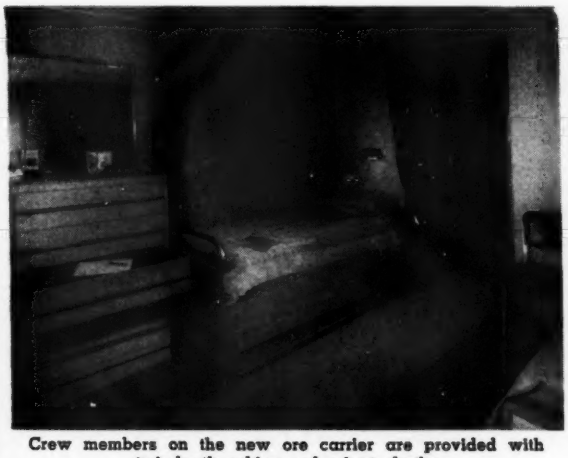
The 710-ft "George M. Humphrey," one of the world's largest cargo vessels, is shown on a sea trial one day after christening

Huge Iron Ore Carrier Launched



Crew members on the new ore carrier are provided with twin-berth cabins and private baths

Through the 16-ft window-wall of the observation solarium, guests may observe loading or unloading operations

ON October 5, the *George M. Humphrey*, one of the world's largest cargo vessels, was christened and launched at Lorain, Ohio. Built for National Steel Corp., the giant iron ore carrier will be operated by the M. A. Hanna Coal Co.

Named for and christened by Cabinet Member George M. Humphrey, the 710-ft vessel has a cargo capacity of 22,000 long tons. The vessel is powered by a 8500 hp engine and is able to sustain a sea speed of 16½ mph.

As is the case on most modern iron ore carriers operating on the Great Lakes, crew and officers quarters on the *George M. Humphrey*, as well as the owner's quarters, eclipse, in comfort and style, equivalent accommodations on the finest ocean liners. Most officers have private state rooms with baths, which in some cases are directly accessible from their offices. Twin-berth cabins with private baths are provided for all crew members. Additional facilities include the officers' dining room and two well-equipped recreation rooms for crewmen. Accommodations have been provided for eight passengers.

An observation solarium and informal lounge area has been provided with a 16-ft window-wall through which guests may enjoy unobstructed panoramic views throughout the 1200-mile round trip. Strategically placed on the forecastle deck, it also enables passengers to watch the loading and unloading operations.

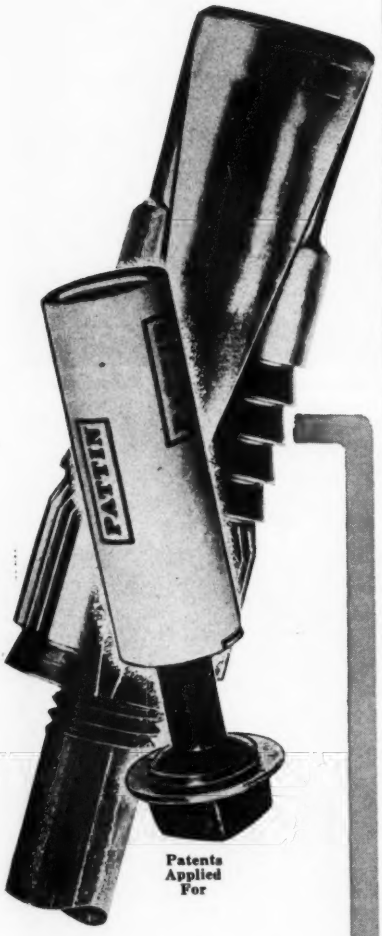
Joiner work on the bulk freighter *George M. Humphrey*—which involves the fitting the interior of the vessel, with the exception of the mechanical and technical equipment—was done by the Arnot Jamestown Division of the Aetna Steel Products Corp.

Anthracite Gasification

The Philadelphia and Reading Coal and Iron Co. has entered into arrangements with Hydrocarbon Research, Inc., for a long-range experimental program in coal gasification utilizing anthracite, it has been announced by Edward G. Fox, president.

Fox said that Hydrocarbon Research, Inc., will carry on experimental work at its Trenton Laboratories for P and R, looking toward the gasification of anthracite and the utilization of the gas products.

The project was described by the P and R executive as the latest step in the company's research program into the conversion of anthracite into synthesis gas. The Philadelphia and Reading Coal and Iron Co. has been carrying on evaluation studies and applied research work in this field for the past several years.



Patents Applied For

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Activity at Algoma

Standard Ore & Alloys Corp., has announced that Stanleigh Mining Corp., Ltd., in which it has a major interest, has acquired over the past year a block of claims in the Blind River Region near Algoma, Ontario, Canada.

A drilling program was begun during October. It is expected that any ore produced on this property will be shipped to and milled at a prospective Algoma plant, two miles from the mine location.

Fellowships Set by Copper Firm

Two graduate fellowships carrying a stipend of $2000 each in Harvard University, at Cambridge, Mass., have been announced by Kennecott Copper Corp.

One fellowship will support the work of an advanced student in economic geology. The other is for a student who can qualify in the graduate school of business administration.

National Lead Operates AEC Lab

The National Lead Co. has been selected to operate the U. S. Atomic Energy Commisison's Raw Material Development Laboratory at Winchester, Mass., which has been operated by the American Cyanamid Co. under Commisison contract since 1951. The change became effective July 1.

The Raw Materials Development Laboratory is principally concerned with development of processes for treatment of uranium-bearing ores in the production of uranium concentrates. During the period of operation by the American Cyanamid Co., the activities of the laboratory were expanded considerably, and its operations were transferred from Watertown, Mass., to a new Commission facility at Winchester, designed by American Cyanamid. Several pilot plants also were built and placed in operation. The laboratory organization has become an important part of the Commission's program to increase production of uranium concentrates. Through its management of the laboratory, American Cyanamid has made an important contribution to the Commission's program.

The National Lead Co. has had wide experience in processing metal-bearing ores. It operates many plants for the recovery of metals from various types of ore feeds, and has long had a research division engaged in process development in this field.

In obtaining the services of the new contractor, the Commission believes that the activities of the Raw Materials Development Laboratory will continue to be carried out at a high level of efficiency and productivity.

New Washer Built

The Panther Coal Co. of West Virginia has completed installation of a new dense medium washer plant at its Panther No. 5 mine at Marybill, W. Va. Production from the new washer began September 15.

Another vessel of the dense medium system, built by the H. J. Daniels Co., Indiana, Pa., was expected to follow the first into production within 60 days.

N&W to Buy Coal

The Norfolk and Western Railway has curtailed operations at its Pond Creek Colliery, in Pike County, Ky. The railway announced that operations were curtailed October 1 and the plant will be suspended entirely as soon as its leases run out.

Pond Creek Colliery had been producing approximately 600,000 tons a year for railroad consumption. The N. &. W. said in a statement that in the future it will buy coal from commercial producers along its lines.

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Repair Flood Damage

Operations were resumed September 13, at the Burton mine of Richwood Sewell Coal Co., which had been closed since July 19 when a flash flood damaged the property. The mine is located 16 miles from Richwood, W. Va., on Gauley River. During the flood the cleaning plant was almost completely destroyed.

Aid Pumping Program

Secretary of the Interior Douglas McKay and Secretary of Commerce Sinclair Weeks have announced with the approval of President Eisenhower a proposed $8,500,000 federal-aid program designed to prevent surface water from flooding mines of the Pennsylvania anthracite fields.

In addition to strengthening the employment security of miners in the coal area, the proposed project would create more than 2000 jobs in extensive surface drainage work and provide many other jobs in the production and installation of pumps and equipment.

Recommendations will be presented to the Congress for an appropriation of $8,500,000 on condition that the State of Pennsylvania contributes at least an equal sum and assumes responsibility for operating and maintaining the project.

In the meanwhile, because Pennsylvania State funds for current drainage work are exhausted, Federal officials will determine if $1,500,000 in Federal funds can be made available at once to continue the work without interruption, pending State and Federal appropriations. Such advance would be deducted from any Federal appropriations made later for this purpose.

Search for Virginia Manganese

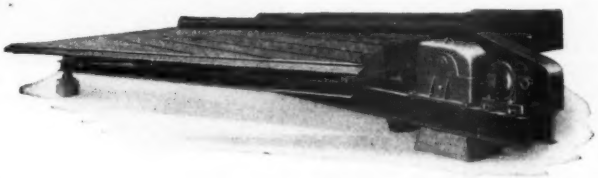
A search for manganese has been started just outside the corporate limits of Buena Vista, Va. About 800 acres has been leased by W. S. Perry of Charleston, W. Va., for an extensive exploration. Drilling operations began in mid-October.

Interest is centered on a 26-acre section where geologists report a structure almost identical with that at Crimora mine, near Waynesboro, Va. Crimora mine is said to have been the largest single manganese ore bed in the United States.

Island Creek Expands

It was announced October 20, that the Cleveland-Cliffs Iron Co., and the Island Creek Coal Co., Huntington, W. Va., will be associated in the coal business through the sale of Cliff's Coal Marketing Division and the Duluth and Port Huron docks to Island Creek, and through them the sale of the Green Bay, Wis. dock, as well as Cliffs' interest in the Escanaba Coal & Dock Co., to the C. Reiss Coal Co. of Sheboygan, Wis. Completion of these changes is expected to be effectuated as of November 1.

The Coal Division of Cleveland-Cliffs markets approximately 4,000,000 tons per year, in addition to acting as distributors of coals from Ohio, Pennsylvania, West Virginia, Illinois, Indiana and Kentucky. Cliffs' Coal Division serves as exclusive sales agents for several producing companies in these areas. Cliffs' coal sales activities and its offices in Chicago, Cincinnati, Detroit, Buffalo, New York, Cleveland and Charlotte will be consolidated with those of the Island Creek Coal Sales Co., and much of the Cleveland-Cliffs personnel will be integrated into the Island Creek Organization. The Cleveland-Cliffs' Coal Division, Minneapolis office and Duluth dock facilities will be consolidated with those of Carnegie Dock and Fuel Co., a wholly-owned subsidiary of Island Creek Coal Co., and presently operating in that area.



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CONCENCO Feed Distributor

The CONCENCO Revolving Feed Distributor is a heavily fabricated all-steel machine with motor drive requiring 1 H.P. or less in operation. It effectively provides a splitting of feed into any desired number of equal portions, to accurately feed circuits or machines in battery for greater overall efficiency. Unexcelled for feeding coal washing tables.

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Quit Research

Research activities of the Anthracite Institute have been discontinued. The move was decided upon when several major Anthracite producing companies set up their own research laboratories.

At one time the Anthracite Institute had a staff of 45 engineers and mechanics in its research department.

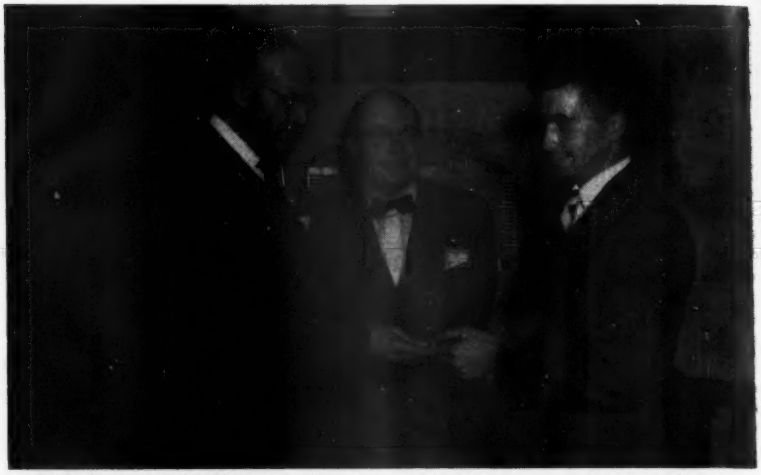
Honor Long Service

Eighteen coal miners with a total of more than 425 years service in U. S. Steel's Columbia Coal Mine, Columbia-Geneva Steel Division, were honored October 23 at a special service award dinner in Dragerton, Utah. Awards and certificates were made to employes completing 20, 25, and 30 years service during 1954 by F. V. Hicks, general superintendent, Coal Mines and Quarries.

In his presentation address Mr. Hicks said, "We all realize that a spirit of cooperation and understanding among all employes is essential to the success of any operation. During these unsettled times we must depend on you older employes to inspire the younger men to carry on this work, and thus assure a continuous and progressive operation which in turn will contribute to the welfare of the employes, the company, the community in which we live, the state and in the final analysis—America. We are fortunate indeed to have so many 'old timers' in our organization."

Thirty other "old timers" who have received awards and certificates during prior years for service of more than 20 years were also guests at the dinner.

The 48 "old time miners" have a combined service record of 1214 years for an average service record of 25.3 years.



M. D. Cooper, of the Oldtimer's Club, presents the Oldtimer's award to the outstanding senior student in Mining Engineering at Virginia Polytechnic Institute, Blacksburg, Va., Ellis Paxton Bucklen. Dean Emeritus E. B. Norris assists in the ceremony.

White Pine Gets New Chimney

Work will begin shortly on the final phases of construction for a 500-ft reinforced concrete chimney to serve a smelter of the White Pine Copper Co. at White Pine in Michigan's Upper Peninsula.

The chimney column was finished last fall by The Rust Engineering Co., of Pittsburgh, which will shortly begin the final job of lining the column to its full height with acid-proof brick.

Designed for a diameter of 12 ft inside the lining, the chimney will be equipped with a lightning rod system, and ladder for the full height of the column. The stack will have a steel platform some 230 ft above its base for technical observations.

Ends Half Century of Service

William Norton Clagett, assistant chief mine inspector of Pocahontas Land Corp., Bluefield, W. Va., has retired after nearly 50 years in the coal mining industry. He has been with Pocahontas since April 1923.

Clagett began his career at Bramwell, W. Va., in 1906. Upon returning to Mercer County after several months in the West, he joined Algonquin and Pawama Coal Co. at Matoaka, and later worked for U. S. Steel Corp. at Lynch, Ky. He also served as engineer for American Coal Co. and was with the Norton Coal Co. before joining the Land firm in 1923.

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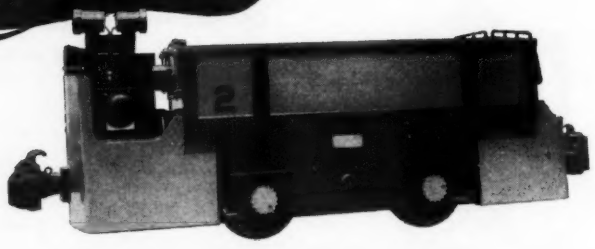

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Sell Kopperston Homes

Homes in the mining community of Kopperston, W. Va., are going to be sold by Eastern Gas & Fuel Associates. Kopperston, with its new modern homes, well-kept lawns, and paved streets, has received national publicity as a model mining community.

When the homes go on the block, miners in the community will be given first choice.

Ship Panther Valley Coal

On October 5, the first railroad car of anthracite produced in the Panther Valley of northeastern Pennsylvania since the Lehigh Navigation Coal Co. closed its mines last spring, was sent on its way to market. More than 1100 miners were back to work for the first time since May.

A new mining firm, Panther Valley Coal Co., has leased three mines, and a central breaker and a number of stripping properties from the Lehigh Navigation Coal Co. It hopes, as demand increases, to add to the mining force.

The coal produced by the company will be marketed through the Lehigh Navigation Coal Sales Co. under the familiar "Old Company Lehigh" trademark.

Coal Dock Readied

Docking facilities for barges that will deliver some 3,100,000 tons of coal annually to the Kyger Creek Plant of the Ohio Valley Electric Corp. have been completed by The Contracting Division of Dravo Corp., Pittsburgh, Pa.

The million-kw Kyger Creek Plant will supply power to the U. S. Atomic Energy Commission's new uranium diffusion plant now being built near Portsmouth, Ohio.

Located on the Ohio River at Cheshire, Ohio, near Gallipolis, the new dock area extends more than three-quarters of a mile along the shoreline. It can handle 25 loaded and 25 empty coal barges.

One of the unique features of the structure is a floating walkway 2459 ft along the face of the dock. The five-ft four-in. wide walkway, constructed of timbers on steel drums, moves up and down approximately 35 ft with the rise and fall of the river elevation. It is held to the steel sheet pile cells by guide flanges welded on the cells. The float is hinged longitudinally at intervals to provide flexibility to withstand docking strains.

Contracts have been awarded by OVEC to two coal companies to provide a yearly supply of 1,550,000 tons each, from Ohio and West Virginia mines to the Kyger Creek plant.

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Successful coal cleaning oftentimes depends upon the proper type of crushing of raw coal, middlings, and refuse. Your crushing equipment is not an auxiliary but is the heart of your preparation plant.

Pennsylvania has specialized in this field and has developed a dependable and accurate method of crusher selection, along with a line of Bradford Breakers, Bradmills, Hammermills, Ring Hammermills, Impactors, Jaws and Single Rolls.

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Kue-Ken Jaws
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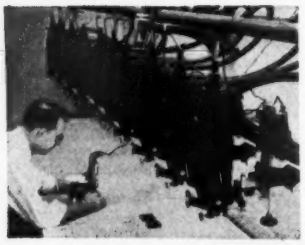
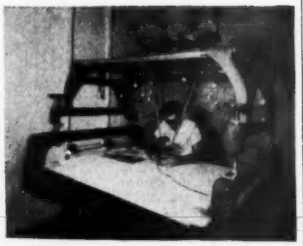
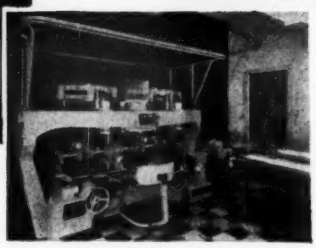
no matter whether your job calls for... any One any two or a combination of the three







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Can't Strip Here

West Virginia's Supreme Court refused (Oct. 11) to consider an appeal of a Roanoke, Va., coal operator from a lower court decision that barred him from strip mining coal on state forest property.

D. S. Blount, doing business as the Cavalier-Peerless Coal Co., had asked the high state court to review a Circuit Court decision of last July 13 which prevented him from strip mining coal in Kumbratow State Forest.

Blount had obtained a 10-year lease to remove coal in March 1953, and had started to move machinery and mining equipment into the forest when he was halted by the lower court order. He had planned to strip from 45 to 90 acres from a seam of coal beneath the heart of the forest land.

The State Conservation Department obtained a temporary injunction against the proposed stripping.

The legal controversy centered over language of a 1934 deed through which the state acquired the property—without mineral rights—and which the state contended was not broad enough to permit strip mining.

The State Supreme Court decided 4-to-1 against docketing the case.

State Conservation Director Carl J. Johnson commented that the high court's action, "indicating that it substantiates the findings of the Circuit Court, puts the Conservation Department in a very good position."

Johnson pointed out that the state does not own mineral rights on some 60 percent of its state forest and park lands, which total more than 250,000 acres.

Abandon Coal Mines

Eastern Gas & Fuel Associates recently announced that it has permanently given up any plans for reopening its closed Carswell and Maitland mines in McDowell County, W. Va. The decision, however, does not affect operation of Eastern Keystone mine, it was stated.

Coal reserves for the Maitland mine and about one-third of those for the Carswell mine have been leased by Eastern Gas to Peerless Gas Coal & Coke Co., Bluefield. These reserves adjoin and will be added to those of the Peerless No. 4 mine.

The remaining two-thirds of the Carswell reserves are next to those of Eastern's Keystone mine and will be combined with them.

Carswell and Maitland mines were opened more than 50 years ago. The former King and Tidewater mines, which had been opened earlier, were combined with Carswell when it was first put into operation. Eastern acquired both Carswell and Maitland in 1928 from the Houston Collieries Co. When closed down last year, they were producing about 3600 tpd.

Sinking Shaft

At Hailey, Idaho, Burt Hayes, president of the Primitive Exploring and Finding Co., reports that work has begun on a shaft to try to follow a vein of uranium bearing quartz ore. A 40-ft excavation has been made with bulldozers and work begun on a 30-ft shaft.

Clay for Cement

Spokane Portland Cement Co. has asked the County Planning Commission for permission to carry on clay mining operations on 40 acres of land southeast of Shelley's Lake in the Spokane Valley of Washington. The clay would replace shale rock now being mined at Boyds, Wash., for the plant at Irvin. The proposed pit would provide about 20 percent of the material needed for the Irvin plant. The proposed property has been drilled and surveyed. It will be an open pit mine.

Will Develop Lead Mines

A group of Colorado Springs, Colo., and Phoenix, Ariz., men have completed the incorporation of a new mining company known as the Minerals Mining and Milling Co., and have started operations in the Rico mining district of Colorado. They have purchased a lease and option to purchase on the Union Carbonate properties owned by George E. Hicks, Dolores County, Colo.

The property contains several thousand tons of low grade lead carbonate ore, which will be treated in the Edwards mill just north of Rico and which was built about two years ago and has never been used. Kenneth Erickson of Henderson, Nev., will have charge of the operations for the company. He expects to mill 100 tpd.

Custom Mill Operating

Contract Milling Co., Spokane, Wash., is enlarging the scope of its operations at Walkerville, Mont., according to reports. The firm built a semi-portable concentrator to process ore from the Marget Ann mine for Mitchell Mining Co., Mount Vernon, Wash. It handled its first batch of custom ore in early October. The ore carried values in lead, zinc and silver. Tungsten ore will also be received from other mine operators, it was said.

Preparations are also under way to make a flotation concentrate of manganese from ore mined by the Mitchell firm.

Blaze Destroys Kellogg Mill

Fire of unknown origin recently destroyed the old west mill of the Bunker Hill & Sullivan Mining & Concentrating Co. The mill formerly one of the main operating units of Bunker Hill, had not been in full operation in recent years. It still housed considerable machinery, however.

To Up-Grade Chrome Ore

Pacific Northwest Alloys, Inc., has begun construction of a chrome concentrator at Coquille, Ore. Scheduled for completion in mid-January, 1955, it is reported the plant will upgrade 55,000 tons of chrome concentrates stockpiled at the site of the old Metals Reserve treatment plant. Material was mined by Humphreys Gold Dredging Corp. and Krome Corp. during World War II.

Ideal Buys Alumina Plant

Sale of the Federal Government's experimental alumina plant at Laramie, Wyo., to the Ideal Cement Co. was recently announced.

The plant was built during World War II by the Defense Plant Corp. as one of four pilot plant operations to determine the feasibility of producing critically needed alumina from raw materials other than bauxite. It was designed to experiment on recovery of alumina from anorthosite found in abundance near Laramie. For the past two years the plant has been operated by the U. S. Bureau of Mines. Ideal is expected to use the plant for its aggregate operations.

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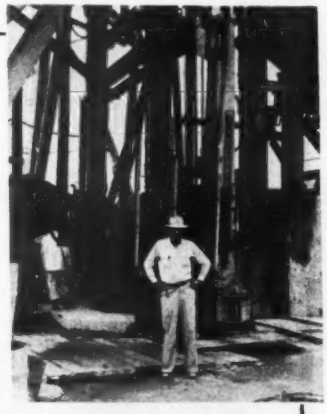

One of the jumbo rigs used to sink two mine shafts simultaneously for more than 1,000 feet. Walter Baer, Drilling Supt., uses 2" and 2⅜" Rok-Bits exclusively on the job.

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Vitro Starts Uranium Mining

Vitro Corp. of America has entered the field of uranium mining, according to an announcement by William B. Hall, general manager of Vitro Uranium Co. division of the corporation.

Vitro has acquired an interest in 57 uranium claims from Sateco Mining Co. in the Gas Hills area of Fremont County, Wyo., and has commenced exploration and drilling in preparation for mining of ore. Announcement was made last year that Vitro had started to explore suitable areas for the exploitation of uranium deposits.

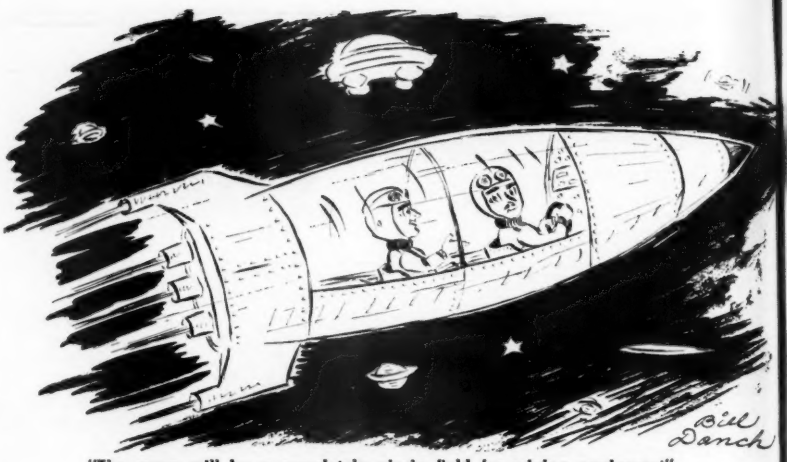
Vitro's other uranium ore interests are near the San Rafael Swell district of east-central Utah, including the Daye-Davis and Desert Queen claims and a nearby Utah school section. In addition the company shares in extensive claims in the Blind River district of Ontario, Canada.

Hall announced that Vitro Uranium has formed an ore and mining department under the direction of Jack O. Horton of Salt Lake City.

Reopen Montana Coal Mine

James R. Brophy, operator of Brophy Coal Co., reports that the firm's No. 4 slope at Red Lodge, Mont., which has been closed since 1921, is being reopened. Old workings are now being reconditioned. An air course will be sunk so that 10 or more men can work underground.

The state of Montana has ordered the Montana-Wyoming and Southern Railroad to resume operations out of Bearcreek, Mont., as soon as possible. The mine was opened by Brophy's father in 1906.



"The moon will be a completely virgin field for mining equipment"

Cordero Expands Activities

The Oregon State Department of Geology and Mineral Industries reports that Cordero Mining Co. will install a small furnace at the Horse Heaven mine in Jefferson County, Ore., to treat ore already broken in the mine left when the property shut down in December 1944. At that time a fire burned the furnace plant and caused closure of the property.

The Horse Heaven was one of the better known quicksilver producers before and during World War II. Cinnabar, the ore of quicksilver, was discovered in the area by A. J. Champion in 1933. The mine began production in 1934. Horse Heaven Mines, Inc. acquired the property in 1936 and produced continuously until the fire in 1944. Cordero Mining Co. purchased the mine in 1941.

In another move, Cordero leased the Reed mine, Yolo County, California, from the Bradley Mining Co. Cordero will explore for additional ore at depth to see if reopening of the mine can be justified. Reed mine is also a mercury mine.

Uranium Holdings Sold

Purchase of uranium holdings of J. R. Simplot Co. of Boise, Idaho, by Camoose Mines, Ltd., of Canada were announced September 27 by Milton G. Agate of Los Angeles, chairman of the board of Camoose Mines, Ltd.

Transaction involves all equipment and machinery in three operating mines, and 375 uranium mining claims in Montrose County, Idaho.

The highly mechanized Simplot mines are reported to be among the largest producers in Colorado. The three mines, Peanut and Gregor Nos. 1 and 2, have been in production almost a year. Drifts are large enough to drive in 15-ton diesel trucks for loading.

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Sunshine Works Five-Day Week

The nation's largest silver producer, the Sunshine Mining Co., has reduced its workweek to 40 hours. The mine had been working 48 hours a week.

The shorter workweek followed an agreement signed by Sunshine and the CIO United Steel Workers for a six-cent hourly general wage increase and fringe benefits amounting to five cents an hour. The move was made to cut expenses by eliminating the extra eight hours a week for which overtime rates were paid.

Fire Razes Montana Coal Plant

A spectacular all-night fire leveled the loading and grading plant at the Roundup Mine No. 3, one mile south of Roundup, Mont., on the night of September 3. Sidney H. Clarke, plant manager for the Roundup Mining Co., said that "totally destroyed" were the tipple, four loaders, a huge coal crusher, several railroad cars loaded with coal, a machine shop and its contents, and an automatic scale house.

The fire apparently started in a pit below the coal crusher where an electric motor had overheated. Although mine crews had removed the motor, a spark may have caused the fire. More than 200 fire fighters were summoned to the mine from surrounding communities. The Roundup mine employs 100 men.

Cut Ore at Jack Waite Mine

Development work at the Jack Waite mine, which straddles the Idaho-Montana state line east of Mullan, Idaho, has resulted in the discovery of ore in a part of the mine where none was anticipated it was recently announced. The ore was encountered in driving one of the upper levels eastward and is just east of the boundary between the states.

Expand Uranium Plant

U. S. Atomic Energy Commission and the Anaconda Copper Mining Co. of Butte, Mont., have signed a contract for the construction of an addition to the uranium ore-processing plant at Bluewater, near Grants, N. M., it was recently announced at the Grand Junction Operations Office of the Commission. Expansion of the plant's facilities follows recent discovery of additional deposits of sandstone uranium-bearing ores in that area by Anaconda.

On May 18, 1954 it was announced that Anaconda and the Commission had signed a contract for an expansion of the Bluewater plant to treat sandstone gangue ores discovered in that area a short time earlier, as well as for the expansion of facilities to handle limestone uranium ores for which the plant was designed and opened in the Fall of 1953. Before this expansion could be completed, more sandstone ores were found, resulting in the planned additional facilities.

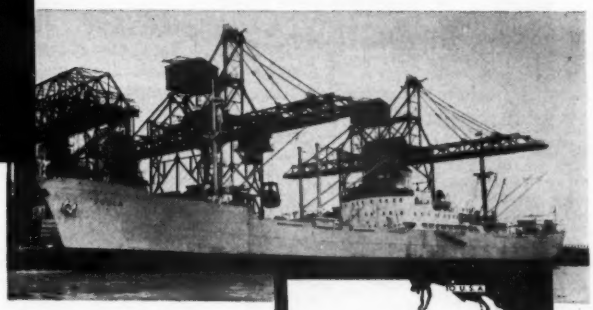
When completed, the Bluewater plant will be equipped to treat the limestone uranium ores in increasing quantities by the carbonate leaching process, and the sandstone ores by the acid leaching process. This is expected to bring about substantial increases in uranium concentrates from this important area of New Mexico, which in turn will stimulate uranium mining operations in the area.

Record Mill Run

Lucky Friday Silver-Lead Mines has completed one of the largest mill runs in the history of the company according to recent reports. From July 11, when the run was started, to October 14, between 15,000 and 16,000 tons of ore had been put through the Golconda Lead Mine's custom concentrator east of Wallace, Idaho. At the Lucky Friday mine, east of Mullan, Idaho, production is being maintained at 120 to 125 tpd; about capacity for the present small shaft facilities.

happy ending of a seven year voyage

First ore from Cerro Bolivar arrives at U.S. Steel's Fairless Works



Unloading the first ore from Cerro Bolivar from the S. S. Tosca at U. S. Steel's Fairless Works, Fairless Hills, Pennsylvania.

From Cerro Bolivar 90 miles to Puerto Ordaz, at the junction of the Orinoco and Caroni Rivers, this first ore shipment moved over tracks—under which lies a Fairchild topographic map.

From Puerto Ordaz 177 miles down the lazy Orinoco, through the Cano Macareo, to the Gulf of Paria, the route of the S. S. Tosca lay through a dredged channel—the charts of the river, the dredging, and the navigational aids based on a Fairchild controlled Photomosaic map.

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THE VOYAGE really began in April, 1947, when one of Fairchild's A-26 photographic aircraft, flying for the Orinoco Mining Company, four miles above the Venezuelan plains, exposed the film on which appeared the image of Cerro Bolivar—truly aerial photography's finest hour.

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Friction Type Hoists

(Continued from page 44)

depth and for more levels than most hoists of this type.

The "C" Shaft that is being sunk at the Cliffs Shaft Mine, will be equipped with Koepe hoists for the skips and the cage. The rectangular shaft, approximately 13 ft by 20 ft, is divided into two skip compartments; a cage compartment; three counterweight compartments; and a ladder road. Power cables, water and air lines and signal cables will occupy a portion of the ladder-road compartment.

Three Koepe hoists, one serving each skip and one for the cage, will be located in a concrete and steel tower headframe over their respective shaft compartments. The tower headframe, with footings in ledge, will extend to a height of 120 ft above the shaft collar to the skip hoist floor elevation. The cage hoist will be located over its respective shaft compartment at an elevation above the skip hoists. Deflection sheaves will be used below the skip hoists and also the cage hoist to position the counterweight ropes in their respective compartments.

Both skip hoists and the cage hoist will be four-rope drive of one-in. diameter for the initial 1300-ft hoisting depth and each hoist will operate in balance with a counterweight. For the initial depth, the hoisting speed for the skips will be 1000 fpm and at the ultimate 4000-ft depth the speed will be increased to 2000 fpm. The skip hoists will have a useful load capacity of 13.6 tons. Ward-Leonard type drive will be used and at the ultimate depth, 1200 hp will be required for the skip hoists and 675 hp on the cage hoist.

The drum or pulley diameters have been selected to match the compartment centers, thus deflection sheaves will not be required. Topographical features allow the hoists to be set on a height directly over the shaft at ground level. Entrance to the shaft will be by a horizontal adit, about 200 ft below the collar.

In view of the fact that

(1) the advantages of the friction drive hoist have been so regarded as to bring it into almost exclusive use in Europe, and

(2) previously installed drum hoists have been converted to this type, and

(3) two companies in North America, after study of European installations, have adopted this type,

it seems that the friction drive hoist must be given thorough consideration by anyone contemplating the installation of hoisting equipment.

Acknowledgments

For the data summarized in this paper, I am indebted to the following:

P. H. Fassari, A. S. E. A., Vasteras, Sweden.

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Arne Oppenhaugh, Orkla Grube A/B, Lokken, Norway.

Thor Amdahl, Fosdalens Bergverks A/S, Malm, Norway.

Dr. E. G. Malmlow, Aros Electric Inc., 16 East 71st St., New York.

H. J. Fraser, Falconbridge Nickel Mines, Ltd., Toronto, Ont.

R. H. Moore, Falconbridge Nickel Mines, Ltd., Falconbridge, Ont.

Fayette Brown, Cleveland-Cliffs Iron Co., Cleveland, Ohio.

H. H. Korpinen, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

Article by E. S. Little and C. M. Barrett, Ontario Department of Mines, in *Canadian Mining Journal.*

Cleveland Cliffs Iron Company Hoists	*Skip Hoists*	*Cage Hoists*
Type of hoist	1 skip	1 cage
Diameter of pulley	118 in.	89 in.
Number of ropes	4	4
Diameter of ropes	1⅛ in.	1 in.
Winding distance	3940 ft	3940 ft
Hoisting speed, maximum	2000 ft./min.	2000 ft./min.
Load	30,000 lb	15,000 lb
Counterweight	35,000 lb	20,500 lb
Motor horsepower	1500 hp	1500 hp
Manner of operation	Push Button	Push Button
Number of levels	2	12

Falconbridge Nickel Mines, Ltd., Hoists	*Skip Hoists*	*Cage Hoists*
Type of hoist	2 skips	1 cage
Diameter of pulley	118 in.	118 in.
Number of ropes	4	4
Diameter of ropes	1¼ in.	1¼ in.
Winding distance	4200 ft	4200 ft
Hoisting speed	2200 fpm	2000 fpm
Load	17,000 lb	13,000 lb
Counterweight	—	22,500 lb
Motor horsepower	1500 hp	665 hp
Manner of operation	Push Button	Push Button
Number of levels	2	15

Copper Cities in Production

E. H. Westlake, president, Miami Copper Co., recently stated in a report to company stockholders that Copper Cities Mining Co., a subsidiary, commenced mining operations and the production of copper concentrates in early August. It is expected that all seven sections of the concentrator will be in operation before the end of the year, bringing the plant to full production. Copper Cities operates in the Miami district of Arizona.

Olivine Being Mined

Scheel Olivine, Inc., has started production of olivine at Hamilton, Skagit County, Wash.

University of Washington researchers are said to have found several uses for the mineral ranging from foundry sand to fire brick.

Montana Mining Meet

The Mining Association of Montana and its Helena Chapter, the Last Chance Gulch Mining Association, will hold their Eleventh Biennial Legislative Meeting in Helena, Mont. on January 26, 1955, according to present plans. There will be an afternoon business session followed by an all-Montana banquet at which members of the Legislative Assembly will be guests of individuals representing all industries in Montana.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for October 1, 1954.

City of Washington,
District of Columbia, ss:

Before me, a notary public in and for the state and county aforesaid, personally appeared John Cameron Fox, who, having been duly sworn according to law, deposes and says that he is the Editor of THE MINING CONGRESS JOURNAL, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in Section 537, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor and business manager are:
Name of publisher, The American Mining Congress, Washington, D. C.
Editor, John Cameron Fox, Washington, D. C.
Business manager, P. D. McMurrer, Washington, D. C.

2. That the owners are: The American Mining Congress—a corporation, not for profit. No stockholders. President, Howard I. Young, St. Louis, Mo.; Executive Vice-President and Secretary, Julian D. Conover, Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

JOHN CAMERON FOX,
Editor.

Sworn to and subscribed before me this 27th day of October, 1954.

KATHRYN A. HATHAWAY,
Notary Public.

(My commission expires July 31, 1957.)

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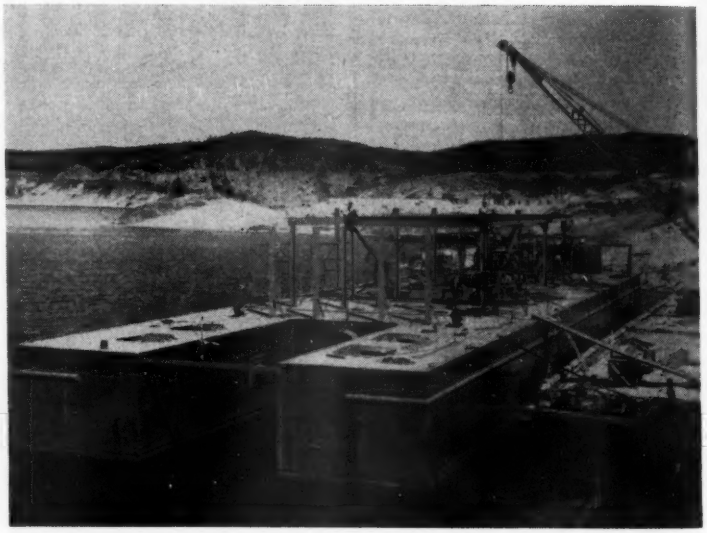


The second of the two largest dredges ever built was launched at Falls Bay, Steep Rock Lake, Atikokan, Ont., Can., in early September. Christened the Joseph L. Block, she is sister dredge to the Clarence B. Randall, previously launched at this location.

The hulls of both the Joseph L. Block and Clarence B. Randall are 176 ft long by 50 ft wide by 14 ft deep. Weight, without machinery, is approximately 600 tons. Each is powered by a 10,000 hp motor driving a 36-in. pump with a capacity of 60,000 gal of water and solids per minute. The engines weigh 45 tons apiece.

Built by Construction Aggregates Corp., Chicago, Ill., the dredges will be operated by that firm for Calend Ore Co., Ltd. The latter is a subsidiary of Inland Steel Co.

In what is believed to be the largest dredging operation ever undertaken, the Joseph L. Block and Clarence B. Randall will remove approximately 160,000,000 cu yd of silt overburden from the basin of Falls Bay. This is equivalent to an excavation three miles long by one mile wide by a depth of 400 ft. This approaches the volume of the dredging operation for the Panama Canal.

Each dredge will be followed by two booster stations of equal pump capacity. The silt will be moved a distance of 61,000 ft through 36 and 42-in. pipelines. It is estimated that each dredge will move this material at a rate of 5000 cu yd per hour or 3,000,000 per month. This is equivalent to an individual dredge capacity of 86,400,000 gal per day.

Reopen Park City Mines Unit

United Park City Mines Co., has reopened the Keetley unit of United Park City Mines after a two-year shut down. The mine, which produces lead, silver and zinc was closed in July 1952. Approximately 200 miners are now employed at the Park City District, Utah, mine and ore shipment has been started.

Climax Mill Expansion

The Climax Uranium Co. has signed a new five-year contract with the Atomic Energy Commission to double the capacity of its uranium mill at Grand Junction, Colo., Arthur H. Bunker, president of Climax Molybdenum Co. has announced. Climax Uranium is a subsidiary of Climax Molybdenum.

Engineering work on the additional facilities is so far advanced that construction will begin at once. The expanded facilities should be in operation inside of nine months.

Climax Uranium has been experimenting with an improved process during the past year and has tested it thoroughly on a pilot plant basis. The expanded mill will incorporate this more efficient process.

Maps Available of Montana

The United States Geological Survey has recently designated the Montana Bureau of Mines and Geology as an authorized map agent for the distribution of topographic and geologic maps of the State of Montana.

Available for free distribution are a limited number of *Index to Topographic Mapping in Montana.* Copies of these may be secured by writing to the Office of the Director, Montana Bureau of Mines and Geology, Montana School of Mines, Butte, Mont.

Pyx Gold Mine

The Pyx mine, a gold prospect in the Greenhorn District of Grant County, Ore., has been taken over by Greenhorn Mountain Development Co., Baker, Ore. Underground work has been under way since early in the year and a 25-ton test mill is under construction. A flowsheet for the mill has been worked out by the Denver Equipment Co.

Switch to Open Pit Operations

Vanadium Corp. of America is changing to open pit mining methods at Monument No. 2 mine in Monument Valley, Ariz. The gradual switch from underground operations will be accompanied by erection of a concentrator at the mine. According to Fred A. Brinker, chief metallurgist, western division, the changes will produce more shipping ore and concentrates for VCA's Durango, Colo., plant, which is also being expanded. Mine-mouth mechanical concentration is expected to extend the life of the orebody.

Gold Hill Mine Sold

Flanders Mining Co., of Grand Junction, Colo., and Whitaker-Bigelow and Co., of Denver have announced joint purchase of the Gold Hill mining properties near Gunnison, Colo., from the U. S. Tungsten Co.

Spokesman for both companies said an exploration program is planned for the near future and will include reopening of the Ida May shaft for possible recovery of both gold and tungsten.

Water Bonanza

Discovery of pure water in large quantities by the Old Nassau Exploration Co., while drilling for the Lila King Mining Co. of Randsburg, Calif., ends a 75-year search for the precious liquid in the Rand Mining District of Southern California.

Inability to haul or pipe sufficient water to the dry, arid Rand District for productive dredge mining has hampered mining efforts. Production of the Lila King Mining Co. has been restricted to 1000 tons of gravel a day since it opened February 3, 1954. The tungsten bearing gravels of the area are presently being mined by drag-line methods.

Looking for more water to allow dredging operations in the area, the company began a search for a water supply at depth. Last August, the first well struck water. Today there are three wells capable of producing 3,500,000 gallons a day.

Negotiations are now under way for a dredge. When completed an excavation 500 ft by 300 ft by 40 ft deep will then be dug to form a lake upon which the dredge will float. It is expected that dredge mining will permit an increase in production to 30,000 tons of gravel a day.

Percussion Drilling

(Continued from page 34)

however, other factors such as connection wear, chipping and upsetting will be the predominating cause of failure on such long-life rods.

How Much Extra Life Can We Expect from Improvements in Drill Rods?

In "S-N" diagrams showing the fatigue life of specimens or machine elements, it is usual to plot the life values on a logarithmic scale since this tends to give a straight line relationship. On page 34 is such a diagram. It plots the fatigue lives which Wlodek obtained on water cooled drill rods made from a Ni-Cr-Mo alloy steel. Line 1 gives the results for as-rolled rods and line 2 gives the results for shot peened rods. The length of the line A-B represents the degree of improvement at 60,000 psi stress which resulted from shot peening. In this case the shot peening produced a six-fold improvement in life, that is, it extended the life from 400,000 cycles to a value of 2,600,000 cycles.

We can also use the same figure to evaluate the effect of an improvement in rod design. If such an improvement lowered the effective stress on a shot peened rod from 60,000 psi down to 50,000 psi, then even this relatively moderate improvement would practically double the life of this rod, that is, it would increase the life from 2,600,000 cycles to a new value of 4,800,000 cycles.

The logarithmic improvement in life. which results from improving the strength or design of a part, is an inherent characteristic, observable in practically all fatigue data. Therefore, any improvements which can be made in drill rods really pay off in much longer life. As an example of this, I would like to give our experience with a connector rod used extensively in longhole drilling at Climax. This is a rather highly stressed rod. It is only 18 in. long so is heat treated over its entire length. The approximate lives we have obtained, expressed in feet of hole drilled to the time of breakage, are given in Table 3.

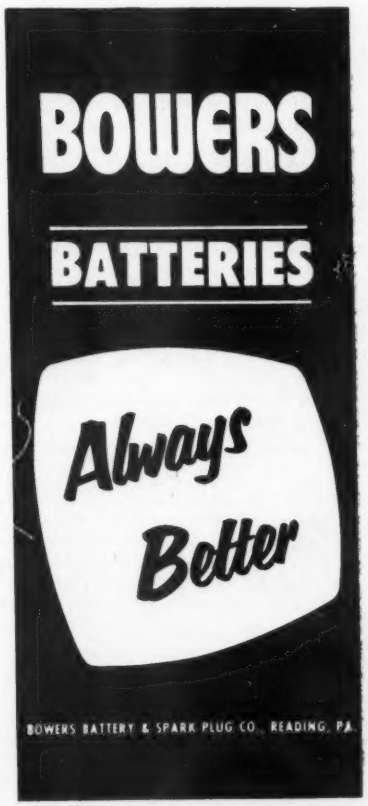
Conclusion

It cannot be emphasized too strongly that the possible improvements in fatigue life of drill rods will be fully realized only when the problem is attacked on several fronts. A combination of improvements is needed. These include factors in design, metallurgy and surface treatment. In addition, rigid control over processing and inspection must be enforced. If proper attention is given to each of these factors, then it may be possible to reduce fatigue failures almost to the vanishing point. The benefits to be gained are very substantial, so the efforts of all concerned should prove to be well worthwhile.

Table 3—Performance of Bonus Rods at Climax

Description	*Approximate Footage*
(A) High Carbon Cr-Mo steel, rough threads, poor heat treatment...	0-1
(B) High Carbon Cr-Mo steel, rough threads, good heat treatment...	150-250
(C) High Carbon Cr-Mo steel, smooth threads, good heat treatment...	300
(D) 4317 alloy steel, smooth threads, carburized, shot peened	1500*-6000*

* These carburized rods did not fail from fatigue breakage but had to be scrapped due to chipping at the threads or shank end of the rod. All other rods broke from fatigue failures occurring mainly at the root of the last thread in the rod.



—BOOK REVIEW—

VARIABLES IN MONTHLY DUST FALL MEASUREMENTS. *Industrial Hygiene Foundation, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13, Pa.*

A six-page reprint available on request outlining the basis for comparison over long periods of changes in dust fall, for comparisons between districts within a city or for comparisons between cities.

GEOLOGY OF THE SILVER LAKE TALC DEPOSITS, SAN BERNARDINO COUNTY, CALIF. *By Lauren A. Wright, Division of Mines, Ferry Building, San Francisco 11, Calif. 30 pp. $1.00.*

THE Silver Lake talc deposits in San Bernardino County, Calif., are the subject of a new special report released by the California Division of Mines.

The new publication, Special Report 38, discusses the geology and geologic history of the mine and describes the talc bodies and workings in detail. Included as an appendix is a discussion of the photography and metamorphism of the principal rock era.

A LOW-COST SAMPLER FOR MEASUREMENT OF LOW CONCENTRATION OF HYDROGEN SULFIDE. *Industrial Hygiene Foundation, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13, Pa.*

AS the title suggests, this paper describes the construction and operation of a low-cost sampler for measuring low concentrations of hydrogen sulfide continuously. Reprint is free upon request to the above address.

VISUAL AID ON AGRICULTURAL, MINERAL AND POWER OUTPUT, *By Oscar H. Reinholt, 28 S. Fair Oaks, Pasadena 1, Calif.*

TO illustrate important, up-to-date facts on the mineral industries not found in encyclopedias, geographies and histories, Mr. Reinholt has designed and made available a number of visual aids portraying graphically the importance of the mineral industry in several states and in the United States as a whole.

A CRITICAL ANALYSIS OF EARLY AND MODERN THEORIES OF MINING SUBSIDENCE AND GROUND CONTROL, *by Prof. Dr. G. J. A. Grond, University of Delft and Dutch State Mines. Published by the Department of Mining, University of Leeds. Paper bound—57 pages. Price 10/6 ($1.48).*

In a foreword, Prof. John T. Whetton of the Mining Department of the University of Leeds, says the problems of ground movement and the behavior of undermined strata have engaged the attention of some of the world's best mining engineers. The theories of the earlier pioneers may now be of historical interest only, however, it is instructive to trace the pattern of thought that motivated students of this important branch of mining.

This publication contains the substance of a series of four lectures delivered in November, 1952, by Professor Grond, together with the discussions that followed. In the course of these four lectures Dr. Grond has covered practically all of the known theories on ground movement and subsidence, certainly all the practical ones. Since a great number of these have been written up previously only in foreign languages, his treatment of the subject in English constitutes a great service to those vitally interested in this topic in this country.

Although the author pays scant attention to work done in the United States, this little book is a valuable compendium of all the best European thinking on the subject.

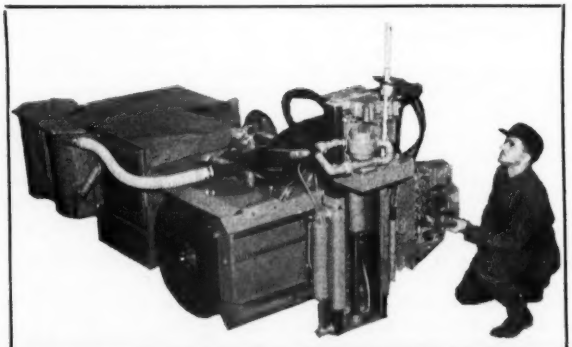
Copies may be obtained postpaid from the Secretary, Leeds University Mining Society. All checks and money orders should be made payable to the Leeds University Mining Society. Cost for each copy is 10/6.

1953 BITUMINOUS COAL ANNUAL. *Bituminous Coal Institute, Southern Bldg., Washington 5, D. C. 164 pp.*

THIS is the sixth edition of the annual issued by Bituminous Coal Institute. It records the continuing progress of the industry in terms of improved efficiency and safety in mining and betterments on coal utilization. Statistical data are provided in interesting and easy to read form. In addition to a multitude of facts, figures and interesting sidelights about coal, a glossary of coal mining terms is included.

METAL STATISTICS 1953. *Published by American Metal Market, 18 Cliff St., New York 38, N. Y.— 848 pages—$3.*

THE 47th annual edition of Metal Statistics contains the same statistical information on ferrous and non-ferrous metals and miscellaneous economic subjects supplied in previous issues. Prices given are generally based on the quotations published in American Metal Market and are representative of wholesale selling prices. Statistics dealing with production and consumption are gathered from a number of authentic sources.



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Triumph On Six-Day Week

L. M. Robinson, general manager, reports that the Triumph Mine, near Hailey, Idaho, is operating six days per week, compared to five-day operations of most lead-zinc mines in northern Idaho. He said the Triumph mine has solved its water problem and the rate of inflow now is only 350 gpm compared to a former 1300 gpm.

Kaiser Installs New Ore Unit

A new plant designed to improve the grade of iron ore from the high-grade deposits of Kaiser Steel Corp. at Eagle Mountain, Calif., has been completed and placed in operation, it was recently announced by Jack L. Ashby, vice-president and general manager. These new facilities, according to Ashby, are the only units of their kind in the West specially built to upgrade iron ore. The higher grade product resulting from this operation will cut transportation costs from mine to mill and will permit new operating efficiencies in the blast furnaces at Fontana.

Average iron content of the ore as mined from the open pit is 51 percent. After being processed through the new facilities, it will have an average iron content of 56 percent.

Copper Firm Enters Uranium Field

The Norbute Corp., an early producer of copper in Butte, Mont., has entered the uranium field by acquiring uranium properties in the Colorado Plateau area in Utah and in Southern Wyoming, where they will enter an exploration and development program.

The firm also announced it has under option 150 claims in Grand and San Juan counties in the Moab area of the Plateau and about 23,000 acres of state leases in Carbon, Sweetwater, Fremont and Sublette counties, Wyo.

Shiprock Uranium Plant

A uranium processing plant, under construction at Shiprock, N. M., for the past 12 months by the Kerr-McGee Oil Industries, Inc., has been completed and went into operation November 1. A contract for the construction and operation of this plant was signed by the Commission and Kerr-McGee a little over a year ago.

Opening of the Shiprock plant brings to nine the number of uranium ore processing plants now in operation in the Colorado Plateau and surrounding area. The others are at Uravan, Rifle, Durango, Naturita, and Grand Junction, Colo.; at Salt Lake City and Monticello, Utah, and at Grants, N. M.

The Shiprock plant will be operated as a custom plant, purchasing and processing uranium and vanadium bearing ores from producers in the Shiprock area. The acid leach method of concentrating employed there will apply to a wide variety of uranium ores. The plant is designed to use the most recent and up to date methods of uranium processing developed by the joint efforts of AEC and private industry.

With the opening of the new mill, Kerr-McGee also takes over the operation of the buying station at Shiprock which has been operated for the Commission by the American Smelting and Refining Co. since 1952.

Install Crushing Unit

Ajax Tungsten Corp., which operates leases on the Tungstar and Hanging Valley properties near Bishop, Calif., as well as the Fletcher group at Darwin, Calif., reported the completion of the installation of a crushing and screening unit on its Darwin properties. The unit has a capacity of 50 tph.

The company holds a lease on the Benware mill near Bishop which is presently operating on a two-shift basis.

Review Sampling Procedure

A report covering a review of sampling proceedings at major uranium ore-buying stations on the Colorado Plateau and adjacent areas has recently been released. Made by the Colorado School of Mines Research Foundation, Inc., the sampling review was in a nature of a recheck of ore-sampling procedures. The Foundation made its original survey in late 1952.

At that time, recommendations were made for the correction of deviations from the accepted standards of good sampling procedure at several of the uranium plants. In all cases, except one, plants have been remodeled in accordance with the recommendations. In the case of one plant which did not accept the recommendations of the 1952 report, plant checking shows that the results currently obtained are satisfactory, according to the report.

Wanted

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
CHAMBER OF MINES CHAIR OF MINING ENGINEERING

APPLICATIONS are invited for appointment to the post of Professor in Mining Engineering who will be head of the Department of Mining.

The substantive salary attached to the post will be as arranged between the successful applicant and the University, but will not be less than £3.000 per annum. In addition, a married man will receive cost of living allowance at such rate as may be authorized from time to time, the present rate being £234 per annum.

Membership of the University Institutions Provident Fund is compulsory and involves a contribution of 7% of the pensionable salary, the Government and the University together contributing an equal amount.

The pensionable salary is at present £1.600 per annum. Membership of the University's Staff Medical Aid Fund is also compulsory in the case of an officer who is eligible for such membership, and contribution will be in accordance with the rules of the Fund.

The Professor will be called upon as part of his duties to serve as a Consultant to the Transvaal and Orange Free State Chamber of Mines. He will not, except under special circumstances, be granted permission to engage in private consultative work.

Duties are to be assumed on the 1st July, 1955, or as soon as possible thereafter. Applicants are advised to obtain the information sheet giving more details in regard to this vacancy from the Registrar, University, Milner Park, Johannesburg, South Africa, with whom Applications should be lodged not later than 31st January, 1955.

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Here's the year's greatest collection of useful information on methods, operating practices and equipment for efficient coal production and preparation. This handy book is actually the 1954 Coal Convention (Cincinnati, May 3-5) in print—all the papers and discussions, fully illustrated, arranged in an attractive, flexible binding for your convenient study and reference.

Coal Mine Modernization, 1954 is packed with hundreds of bits of information and ideas for the practical mining man.

Order your copy today—and order extra copies for other key men in your company. The price is only $3.00 per copy—and a special rate of $2.75 each applies on orders for 10 or more copies.

Published by AMERICAN MINING CONGRES

RING BUILDING WASHINGTON 6, D. C.

Manufacturers Forum

Build New Conveyor

A completely new underground belt conveyor for coal and metal mines has been announced by A. R. Anderson, manager of mining sales, the Jeffrey Mfg. Co., Columbus, Ohio. Called Type 80-A, the conveyor is designed for heavy duty and high tonnage in

mines where the main haulage system is a semi-permanent or permanent installation.

The 80-A head section features tandem drive pulleys which provide maximum height, and a pneumatic take-up for automatic belt tensioning. The head section is adaptable to motor drives up to 160 hp and provides belt speeds up to 600 fpm.

The 80-A conveyor frame is built for 30, 36, 42 and 48-in. belts and 4, 5 or 6-in. diam idler rolls. The frame permits a choice from a variety of standard idlers.

New Wound-Rotor Motor

What they believe to be the first rib-type enclosed, fan-cooled wound-rotor motor to be made with slip rings, brushing rigging, rotor and stator inside a single frame enclosure has been announced by Allis-Chalmers Mfg. Co.

The first Allis-Chalmers explosion-proof wound rotor motor to bear the Underwriters' Laboratories label, the new unit is available at 1800 rpm and slower speeds, in frames 284 to 505, in standard enclosed or explosion-proof construction.

In general, the new motor is applicable where very low starting current, high starting torque, smooth acceleration, jogging or variable adjustable speed dictate the use of a wound rotor motor and where moist, dirty, corrosive, or hazardous atmospheres require a totally enclosed motor.

Construction features of the new motor are described in leaflet 51R8195, available on request from Allis-Chalmers Mfg. Co., 972 S. 70th Street, Milwaukee, Wis.

Eye Protection

A new Skullgard Eyeshield, designed for convenient cap-mounting on all types of MSA Skullgard protective headgear, has been announced by Mine Safety Appliances Co., Pittsburgh, Pa.

The device, made of formed plastic, offers unobstructed vision. The eyeshield is hinged at the peak of the Skullgard so that it can be flipped down into position when protection is needed. It will remain firmly in either the up or down positions.

A complete description of the new Skullgard Eyeshield has been published in Bulletin No. 0302-3, available from Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.

Honor Long-Time Employes

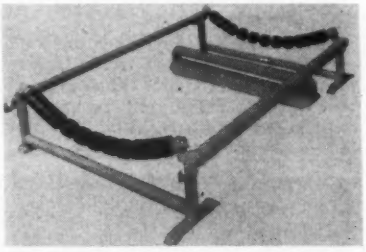
On November 3, Goodman Mfg. Co., Chicago, held its annual old-timers' banquet. Diamond pins were presented to eight employes who had completed 35 years of service this year, and to 17 who reached the 25-year mark. With these presentations the number of those who have reached or passed the 35-year status is 68, while the 25 years or more group totals 148. All are actively at work, the majority at the Chicago plant, but with branch office districts well represented.

Cut Masonry

A portable masonry hole cutting machine has been marketed after three years of research and experimenting by the Molco Drilling Machines Corp., 1100 20th St. N. W., Washington, D. C. It uses a self-sharpening diamond drilling bit to cut holes ½ to 10 in. in diam through hard aggregate, including any steel reinforced building material, to a depth of 18 in. (deeper holes may be drilled by placing an extension shaft on the bit). The unit is available in two models, one and two hp.

New Idler

A cable-suspension idler for belt conveyors is now offered by Joy Mfg. Co. Known as the Limberoller, it uses only two bearings, and carries the belt on resilient, pressure-molded neoprene discs, all of the same size and all re-



volving at the same peripheral speed. Discs are molded to a neoprene-sheathed, flexible steel cable, freely suspended from the two bearings. In continuous contact with the loaded belt, the discs reportedly exert a slight gripping action that holds slippage to a minimum, and tends to keep the belt aligned.

The Limberoller permits conveyor heights from 13¼ to 15¾ in. and is available for belt widths of 24, 30 and 36 in. Further details are offered in Bulletin LD-103.

Hook-on Volt-Ammeter

A new wide range pocket size volt-ammeter for measuring alternating current and voltage quickly and accurately has been introduced by the General Electric Company's Instrument Department.

The new product is designated AK-4, and includes 150/300/750 volts a-c

as its volt ranges, according to G-E engineers.

Capable of measuring current on both insulated and non-insulated conductors without cutting the conductor or interrupting work, the new volt-ammeter is equipped with scales that automatically change when the range selector knob is turned thus reducing the possibility of reading a wrong scale.

Current range of 10/30/100/300/800 amp a-c provides for the measurement of currents usually encountered in industrial or commercial circuits.

New Steel Conveyor Pulley

American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa., announces a complete new line of type "HD" (Heavy-Duty) steel conveyor pulleys with interchangeable split tapered hubs in the same price range as standard duty conveyor pulleys.

According to the maker an important feature of the "HD" conveyor pulley is the new interchangeable WT (Wedg-Tite) split tapered hub, which when drawn into the pulley end-disc, squeezes its shaft with a

bulldog clamp-grip. This feature should add considerably to the life of the installation and at the same time reduce maintenance and speed assembly.

The pulleys are available with corrosion-resistant coating and can also be supplied complete with American Griplex Spiralagging.

Build Your Own Safety Guards

Safety guards for gears, belts, flywheels and all moving parts of machines, as well as guards for individual punch press dies, can be made by the use of standardized guard parts manufactured by the Harrington & King Perforating Co. of Chicago.

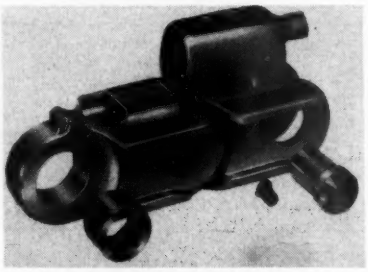
It is said that the only tools required are a screw driver, hammer, hand snips and a hack saw so that guards can be designed, assembled and installed right at the point of use. This saves the cost and delay of drawings and outside fabrication.

Full details of H & K Build-It-Yourself guards are available in bulletin form, by writing F. P. Hutchinson, Harrington & King Perforating Co., 5655 Fillmore Street, Chicago 44, Ill.

Cutter Chain Takes All Bits

To accommodate all types of ½ by 1-in. bits, a new coal cutter chain has been announced by the Bowdil Co., Canton, Ohio.

It has been made available in response to many requests from operators who desire the performance feature of Bowdil's chains but: (1) Their existing equipment represents



a sizeable investment, such as in sharpening equipment; (2) Where a complete changeover to Bowdil bits is felt uneconomical at present; or (3) Where changing and varying conditions do not make such a changeover practical at any time.

The new ½ by 1-in. Bit Chain operates in all Bowdil cutter bars, as well as all other makes of bars.

Takes on New Line

The Nolan Co., Bowerston, Ohio, has concluded an arrangement under which it will take over production of the Phillips Cross-Over and Kick-Back Dumps and Phillips Mine Car Control Equipment, Mine Run Weigh Hoppers and Radial Chutes, formerly manufactured by Phillips Mine and Mill Supply Co., Pittsburgh, Pa.

Under the transfer of this production, Nolan takes over all inventory, patterns, drawings, patents, etc., dealing with the Phillips line of dumps and car controllers, and the Phillips name will continue to be used in connection with the manufacture and marketing of these products by Nolan.

Distributor for New Battery

National Mine Service Co. has been appointed exclusive distributor in the mining industry for Sonotone Corporation's sintered-plate, nickel-cadmium battery. Powering of shuttle cars, mine locomotives and mine jeeps are among the immediate applications for the battery.

It is said that the closely-packed, sintered-plate construction greatly increases active material area, providing large capacity in small cell volume, very low internal resistance and high discharge rate in proportion to the amp-hour capacity. Operation of the battery is reportedly excellent in temperature extremes and cells may be stored in any state of charge or discharge. Life tests of over 3000 cycles of charge and discharge showed no appreciable loss of active material from the sintered plates, although the cells were subjected to excessive conditions of vibration and shock, the company said.

V-Belt Fasteners

Flexible Steel Lacing Co., 4607 Lexington St., Chicago 4, Ill., has announced recent improvements in its line of Alligator V-Belt fasteners. They include the substitution of a nylon bushing for a steel bushing. The company claims this not only reduces the weight of the fastener but helps to absorb shock and adds to the wear-resistance of the fastener.

Uranium Detector

A new, sensitive, portable radiation detector has been developed by the Detectron Corp., North Hollywood, Calif. Using bismuth counter tubes, the new detector has been designated the Model 390-B Bismuth Nucliometer.

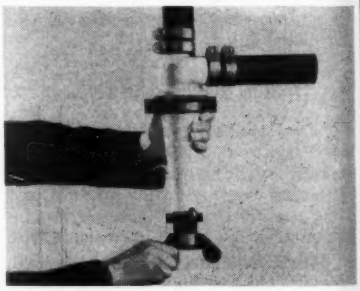
The 390-B is reportedly excellent for long range detection of radiation, for airborne use, for grid map surveys and for oil survey work. The Bismuth Nucliometer is not sensitive to heat. Field tests in temperatures as high as 116° are said to have been successful.

In developing the instrument, Detectron engineers have stressed sensitivity, dependability and stability. Special attention has also been given to ruggedness and compactness.

For full details, write to the Detectron Corp., 5420 Vineland Avenue, North Hollywood, Calif., and request folder M1-M2.

Porcelain Cyclone

The Dorr Co. announces the availability of the Type P50 DorrClone capable of separations in the 10 to 20-micron range on non-abrasive, rela-



tively fine feed. Constructed completely of porcelain with a cone 50 mm in diam, the new wet cyclone, according to the manufacturer, is particularly applicable to chemical, metallurgical and non-metallic classification problems requiring heat and corrosion resistant materials of construction.

Developed in Germany, this new unit has been applied to the classification of clay and calcium carbonate slurries. It is generally adaptable to

all non-abrasive fine classification problems, especially those in which hot or corrosive feed would damage the cast iron or rubber lined Dorr-Clones normally recommended. Further information may be obtained from the Dorr Co., Barry Place, Stamford, Conn.

Rotary Compressors

The complete line of Chicago Pneumatic Portable Rotary Compressors in 125, 210, 365 and 600 cfm sizes is now available through dealers.

CP Power Vane Compressors are powered by General Motors Series 51 and Series 71 Diesel Engines, and Hercules Gasoline Engines.

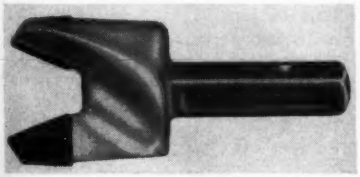
For complete information write to: Chicago Pneumatic Tool, 6 East 44th St., New York 17, N. Y. Ask for Bulletin 734.

Float-Sink Tester

Robert Holmes & Bros., Inc., 510 Junction Ave., Danville, Ill., recently announced a new float - sink testing machine. The company reports that the "Holmes Float-Sink Testing Machine," has been proven by test and field data during the last several years. Primary purpose of the equipment is to check the operation of gravity type separation equipment. Write the company and ask for Bulletin No. 106.

Introduce Coal Drill Bit

Schroeder Brothers, Pittsburgh, Pa., has introduced the new Schroeder BH Drill Bit for hydraulic hand-held coal drills. This new carbide-tipped bit



is said to promote faster drilling. It has a heat-treated forged steel drill body and features greater clearances at the drill head to reduce drag, and reduced area of penetration for ease of feed. BH Drill Bits are available from stock in 1¾ and 1⅞-in. sizes to fit standard ½-in. square auger bits.

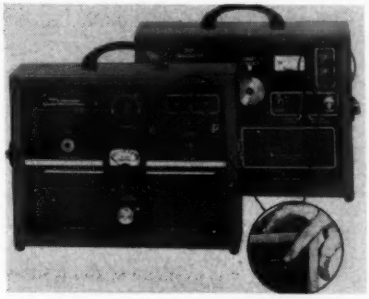
Announce Plastic Pipe Line

A new lightweight flexible plastic pipe has been developed by Quaker Rubber Corp., Division of H. K. Porter Co., Inc., according to G. A. Dauphinais, vice-president and general manager.

Quaker plastic pipe, Series "200," is made of virgin polyethylene resin, and is guaranteed to be non-toxic. The manufacturer claims it will not rot, rust, or corrode, is easily handled, and requires no special tools to install.

Locate Buried Pipe Lines

A battery test switch for the instantaneous testing of both transmitter and receiver batteries is the newest development now being engineered into the latest model "505" Pipe Detectors. The Detectron Corp., 5420 Vineland Avenue, North Hollywood, Calif., manufacturers of the detector, in announcing this new feature have stated that the operator can now have



positive assurance of maximum battery function at all times while detecting, tracing, and estimating the depth of buried pipes, cables, conduit, etc.

The more important functions performed by this new model are the detection of unknown pipes and conduits —also cables, valves, services and stubs. It will also trace buried pipes and conduits and will center them to determine the exact location.

— *Announcements* —

E. J. Longyear Co. announces the appointment of the **Wortham Machinery Co.** of Cheyenne as sales representative for the state of Wyoming, and for western South Dakota.

Joy Mfg. Co. has announced the appointment of **Samuel S. Douglas** as special representative to the Iron and Steel Industry.

Aeroquip Corp., Jackson, Mich., recently announced the appointment of **Forrest F. Hinkley** as general manager of Aero-Coupling Corp., Burbank, Calif., Aeroquip subsidiary.

Edward H. D. Gibbs has been appointed sales manager of **Heyl & Patterson, Inc.**, Pittsburgh. Gibbs joined Heyl & Patterson in 1948 as a contracting engineer and has served in that capacity until his recent appointment.

Wilmot Engineering Co., Hazleton, Pa., has announced several additions to its engineering and sales personnel in connection with a program of diversification of the company's line of coal preparation and ore concentration equipment. **Jordan H. Rockefeller** and **Ralph Edfort** have joined the engineering department at the White Haven, Pa., plant. **Otto von Perbandt**, who recently joined the Wilmot Engineering Co. as contracting engineer for the Coal Preparation Equipment Division, has assumed a similar responsibility for sales of the new Ore Concentration Equipment Division. **Henry Otto** has been placed in charge of sales for both equipment divisions in the western Pennsylvania and eastern Ohio territories.

Recent appointment of **National Mine Service Co.** of Beckley, W. Va. and Pittsburgh as a dealer to sell **Kennametal** mining tools, has been announced by Kennametal Inc.

Complete stocks of Kennametal cutter bits, drill bits, augers and other tools are being maintained for prompt delivery at all six of National Mine Service Co. warehouses.

The **Eimco Corp.** has announced completion of its new research and development center. Located at 301 S. Hicks Road, Palatine, Ill., the center will be devoted primarily to research and development work in the field of liquid-solids separation.

CATALOGS AND BULLETINS

CORE DRILLING MACHINE. *Sprague and Henwood, Inc., Scranton 2, Pa.* Bulletin No. 160 describes the company's Model 142 core drilling machine. Complete specifications and working data are included, as is a list of available accessory equipment required for successful diamond core drilling.

DENVER SPIRAL RAKE THICKENER. *Denver Equipment Co., P. O. Box 5268, Denver 17, Colo.* The booklet describes a mechanical rake and settling unit for the separation of solids from liquid. Dimensions, specifications and capacities of steel, wood or concrete thickener tanks in sizes ranging from 3 to 80 ft are given. A suggested circuit completely equipped for thickening and filtering is shown in flowsheet form. Ask for Bulletin T5-B5.

GENERAL PRODUCTS CATALOG. *Bucyrus-Erie Co., South Milwaukee, Wis.* This is a new edition of Bucyrus-Erie's general catalog (GC-5A), describing the company's complete line of excavating, drilling and material handling equipment. Several recent additions to the company's products are included as are equipment specifications.

ROOF BOLTING DRILL. *Goodman Mfg. Co., Halsted St. & 48th Pl., Chicago 9, Ill.* Catalog 5410 describes the Holman Dryductor for dust control in percussion drilling. With this dust collector, dry dust is drawn through the hollow drill steel, thence by pipe line to a dust container.

MATERIAL HANDLING EXCAVATORS. *Marion Power Shovel Co., Marion, Ohio.* Two 16-MM color-sound movies featuring material handling excavators in action are available from Marion Power Shovel. "The Marion 191-M" tells the story of the world's largest shovel on two crawlers, and "Marion and You" features the company's entire line. The films are offered without charge to organizations and companies upon request to the Advertising Department.

Index to Advertisers

	Page
Allis-Chalmers Mfg. Co. Tractor Division	1
Ammann Photogrammetric Engineers, Jack	94
Anaconda Wire & Cable Co.	14
Barber-Greene Co.	88
Bethlehem Steel Co.	41
Bowers Battery & Spark Plug Co.	101
Brunner & Lay, Inc.	95
Bucyrus-Erie Co.	23
Centrifugal & Mechanical Industries, Inc.	88
Chiksan Co.	Second Cover
Copco Pacific, Ltd.	Third Cover
Crucible Steel Co. of America	20
Deister Concentrator Co., The	91
Denver Equipment Co.	24
Du Pont de Nemours & Co., Inc., E. I.	13
Electric Storage Battery Co., The	6
Engineers Syndicate, Ltd.	100
Fairchild Aerial Surveys, Inc.	97
Fletcher & Co., J. H.	102
Flood City Brass & Electric Co.	96
General Electric Co.	2-3
Greensburg Machine Co.	92
Hercules Powder Co.	21
Indiana Foundry Co.	90
Ingersoll-Rand Co.	18-19
Jeffrey Mfg. Co.	4
Joy Mfg. Co.	15
Kennametal, Inc.	22
Link-Belt Co.	26
Loftus Corp., Peter F.	87
Mine Safety Appliances Co.	Back Cover
Mott Core Drilling Co.	108
National Carbon Co.	9
New York Air Brake Co., The	12
Ohio Brass Co.	16
Pattin Mfg. Co.	90
Pennsylvania Crusher Co.	93
Pennsylvania Drilling Co.	108
Precision Radiation Instruments, Inc.	103
Read, Davis	87
Salem Tool Co., The	8
Sanford-Day Iron Works	25
Sprague & Henwood, Inc.	10
Standard Oil Co. (Indiana)	7
Stratoflex, Inc.	98
Timken Roller Bearing Co.	11
United States Steel Corp. American Steel & Wire Division, Columbia-Geneva Steel Division, Tennessee Coal & Iron Division, United States Steel Export Co.	17
Universal Vibrating Screen Co.	108
University of Witwatersrand	103
Victaulic Co. of America	99
Woomer & Associates, J. W.	87

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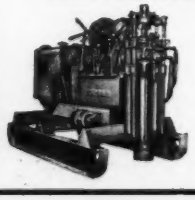

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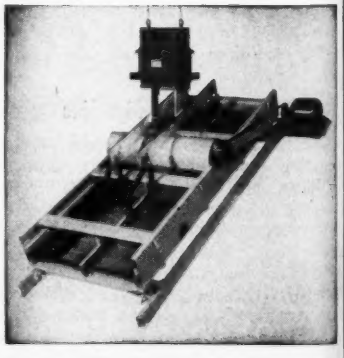

a tale of five miners...

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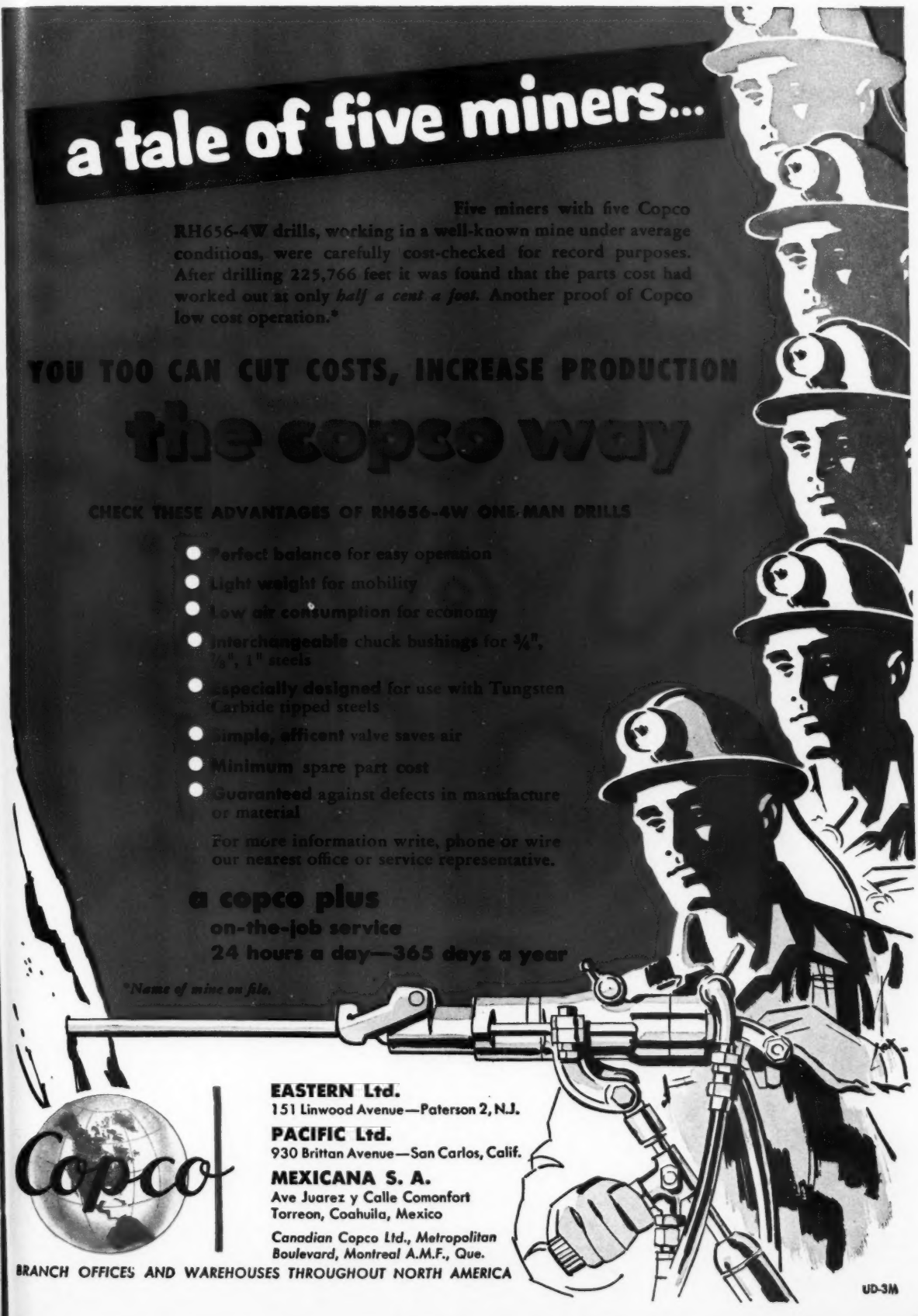

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METHANE

M.S.A. METHANE DETECTOR TYPE W-8

Portable, accurate instrument for measuring methane content of mine air at working face, break-throughs, air courses, and other points in mine where methane may accumulate. Operator simply squeezes rubber hand-bulb a few times, draws in air sample, and amount of methane is indicated on easy-to-read dial in less than 30 seconds. Two scale ranges—for greater reading accuracy—0 to 2% and 0 to 5%. U. S. Bureau of Mines Approved. Write for bulletin.

M.S.A. METHANE TESTER TYPE E-2

Streamlined, pocket sized unit, indicates methane concentrations as low as .2% in mine air. Pump is operated with the fingers while tester is held in palm of the hand. Edison Electric Cap Lamp battery provides dependable power. Unit connects and disconnects quickly from battery. U. S. Bureau of Mines Approved. Write for bulletin.

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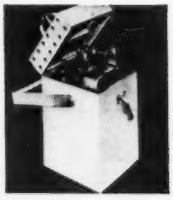
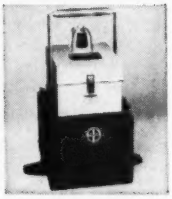
AT THE WORKING FACE





M.S.A. METHANE ALARM

This unit provides continuous sampling and automatic warning of hazardous methane concentrations during entire working shift. Sampled air that exceeds pre-determined safe limit sets off unit, and a flashing red light alerts miners. Portable, or available with shock mounting assembly for use on machinery. Edison R-4 Battery supplies power. Write for complete details.

IN RETURN AIR SYSTEMS

M.S.A. METHANE RECORDER

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